WATER RESOURCES

This section describes water resources in the Study Area and potential impacts on those resources as a result of the proposed action. See the sections, *Floodplains* and *Waters of the United States*, beginning on pages 4-110 and 4-116, respectively, for discussions of the anticipated impacts.

AFFECTED ENVIRONMENT

Surface Water

The Salt and Gila rivers are the major surface water resources in the Study Area (Figure 4-31). The Salt River, located in the central portion of the Western Section of the Study Area, discharges to the Gila River near the northwestern boundary of the Study Area. Flow in the Salt River is seasonal and intermittent, influenced by groundwater withdrawals, treated sewage effluent discharges, diversions for irrigation, return flow from irrigated areas, and occasional floodwater releases from upstream dams.

Watershed Description and Flow Characteristics

The proposed action lies within the Gila River watershed, which encompasses an area of approximately 57,900 square miles in Arizona and New Mexico. The basin includes the greater Phoenix metropolitan area and receives water from the Salt and Verde rivers (Figure 4-32). Surface water flow in the basin is limited to periodic releases from upstream reservoirs, wastewater treatment plants (WWTPs), agricultural return flows, "dry" flows from stormwater outfalls (e.g., landscape irrigation runoff), and runoff from storms in the watershed below the reservoirs (ADOT 1989). Streambeds in the greater Phoenix metropolitan area have been left seasonally dry because of surface water diversions into reservoirs located on the Gila, Verde, and Salt rivers.

The Salt River Basin encompasses approximately 5,980 square miles and contains the Roosevelt, Apache, Saguaro, and Canyon reservoirs, with greater than 90 percent of the flow entering the system upstream of Roosevelt Lake. The Salt River Basin is the primary source of domestic and agricultural water for the Phoenix metropolitan area. The Granite Reef Dam and Diversion Structure, located approximately 25 miles east of the Study Area, diverts the majority of flows from the Salt and Verde rivers (including releases from upstream reservoirs) to an extensive canal system. The canal system is funded and owned by Reclamation and operated by SRP for the purposes of delivering water for agricultural and domestic use. Flow characteristics of water in the Salt River vary and are determined by canal diversions and the magnitude of releases from upstream reservoirs, which in turn depend on snow and rainfall conditions in the watershed. Historical records indicate that between 1940 and 1965, the Salt River channel through the Phoenix metropolitan area remained generally dry. Between 1965 and 1992, flows ranged from flood conditions to small releases as a result of increased rainfall in the watershed.

Surface water in the Eastern Section of the Study Area is limited to runoff from storms in the local watershed. Storm runoff from the southern side of the South Mountains discharges to the south through drainage culverts along Pecos Road. This storm runoff conveyance continues to the south through ephemeral washes to Community land.

Development along the southern side of the South Mountains in the Eastern Section of the Study Area consists of residential and commercial uses typical to the region. The City of Phoenix generally requires retention of flows from a 2-hour, 100-year storm (see description, page 4-110). The combination of residential and commercial development and the City of Phoenix stormwater retention requirements has changed stormwater attenuation. Development has increased stormwater flows, but the implementation of the City of Phoenix retention requirements may reduce stormwater flows to levels dissimilar to those of natural conditions, assuming retention facilities were constructed as part of ongoing development.

Surface Water Quality

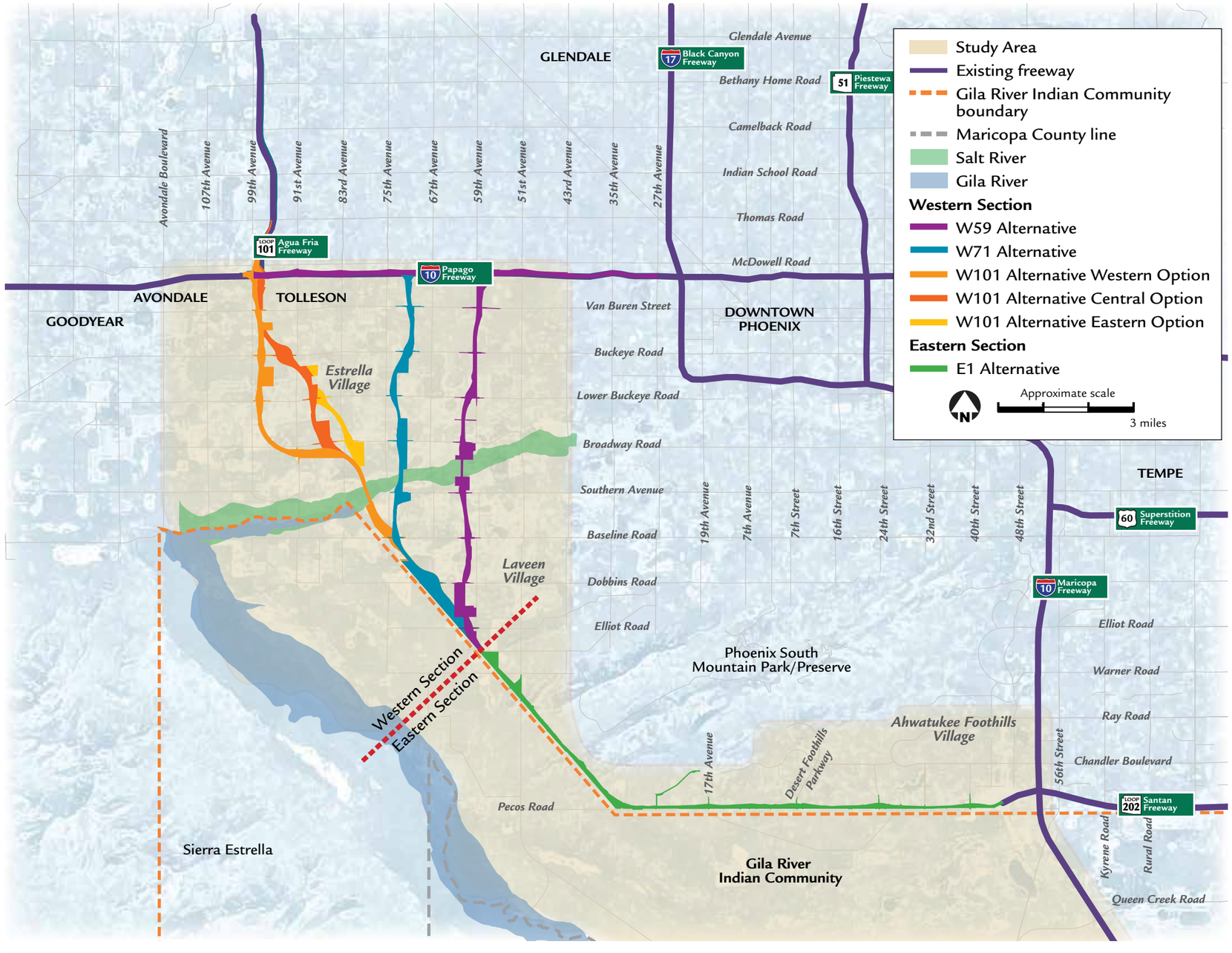
"Water quality limited waters" are water bodies assessed by ADEQ as having impaired quality and that need more than existing technology and permit controls to achieve or maintain water quality standards for intended uses in accordance with Section 303(d) of the Clean Water Act (CWA). The CWA Section 303(d) list identifies those waters that are impaired and the pollutant(s) causing impairment (ADEQ 2011). Several reaches of the Salt and Gila rivers are on the Section 303(d) list, including that portion of the Salt River in the Study Area (see Figure 4-36 on page 4-116).

The quality of the water in the Salt and Gila rivers is influenced by several factors. Total dissolved solids are the major constituent associated with degraded water quality. Sources of total dissolved solids in the Salt River may be traced to saline springs, mining operations, agricultural practices (including irrigation return flows), and other watershed activities associated with nonpoint source pollution (ADEQ 2011). Intermittent runoff from the existing road system in the Study Area is conveyed to the Salt River by storm drain facilities or washes or through percolation into the ground in areas not served by storm drains. Road runoff water quality may be impaired by suspended and dissolved contaminants from the road surface that contribute to degradation of surface water quality.

The Flood Control District of Maricopa County (FCDMC) has interconnected and shared drainage systems with the municipalities in the county, and stormwater discharges from nearly all its facilities have the potential to reach the Salt/Gila River system. Because of the shared drainage systems, FCDMC has worked with municipalities, EPA, and ADEQ to comply with the Arizona Pollutant Discharge Elimination System (AZPDES) regulations. Where possible, FCDMC has negotiated with multiple municipalities to locate, identify, and eliminate pollutants associated with regulated discharges. FCDMC also collects stormwater quality data for Arizona Pollutant Discharge Elimination System permit compliance and inclusion in the FCDMC Regional Stormwater Quality database. As a result of collaboration with the municipalities on permit requirements, FCDMC operates a network of stormwater quality monitoring stations throughout Maricopa County. Sources of impacts on surface water quality in the Study Area include:

- nonpoint source pollution
- drainage from the southern side of the South Mountains near Ahwatukee Foothills Village

Figure 4-31 Major Surface Water Resources



The Salt and Gila rivers are the main water features in the Study Area. Portions of the Salt River have been subject to restoration projects in recent years (see the section, Waters of the United States*, beginning on page 4-116, regarding these projects).*

- Gila Drain discharges
- sand and gravel pit mining operations within and upstream of the Study Area

The Southeast Valley Regional Drainage System (SEVRDS) is part of a large watershed that drains the eastern portion of Maricopa County, including the area from Chandler to the Gila Drain. The Gila Drain discharges into the Gila River on Community land, west of Maricopa Road, near the Lone Butte Wastewater Treatment Facility. A stormwater detention facility provides treatment of stormwater to remove suspended sediment, nutrients, and other pollutants.

EPA has authorized ADEQ to operate the National Pollutant Discharge Elimination System and satisfy the requirements of Section 402 of the CWA at the State level. ADEQ implements the AZPDES permit program, regulating activities on nontribal lands resulting in the discharge of pollutants into jurisdictional waters. For most construction projects the program is regulated through the Construction General Permit. To satisfy Section 402 requirements, ADOT and its contractors file a Notice of Intent for coverage under the Construction General Permit with ADEQ and prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) to prevent erosion and the discharge of pollutants during construction. After construction is complete and the site is stabilized, ADOT and its contractors would file a Notice of Termination with ADEQ indicating that coverage under the Construction General Permit is no longer needed.

Municipal separate storm sewer systems (MS4s) convey stormwater runoff through drains, streets, and open channels, directly discharging untreated stormwater into retention basins, washes, rivers, or lakes.

Municipalities operating MS4s within local urbanized areas designated by EPA or ADEQ are required to obtain individual discharge permits under AZPDES authority. Large MS4s in the Study Area are operated by ADOT, Glendale, and Phoenix, which implement individual permits within the Study Area. Small MS4s in the Study Area are operated by Chandler, Goodyear, Tolleson, and Avondale.

ADOT's MS4 permit authorizes the discharge of stormwater and allowable nonstormwater flows to jurisdictional waters for three elements:

- Activities associated with the MS4 operated by ADOT. ADOT is implementing a Statewide Stormwater Management Program to address operation of its MS4 facilities (i.e., culverts, outfalls); it includes best management practices (BMPs) development and implementation and monitoring of outfalls following storms.
- Activities associated with construction—from the commencement of construction activities until final stabilization—that are initiated and controlled by ADOT. Construction project activities are addressed similar to the Construction General Permit with implementation of a SWPPP and filing of Notices of Intent and Notices of Termination with ADOT and other MS4s having jurisdiction; however, ADOT has specific guidance for erosion control plans and SWPPPs.
- Facilities associated with industrial and maintenance activities owned and operated by ADOT (ADEQ 2013).

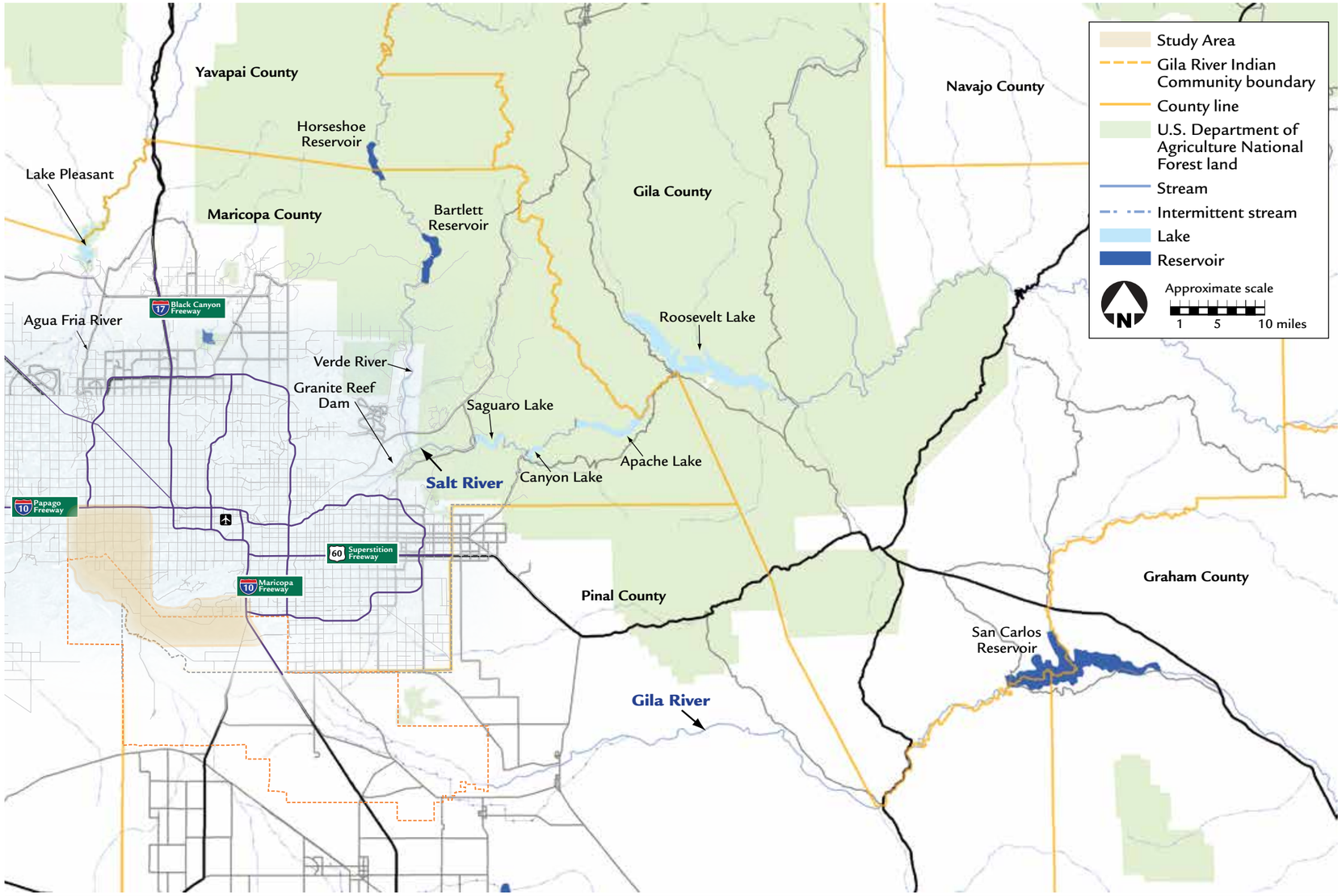
Groundwater

Groundwater Setting and Development

Groundwater is a source of public water supply in Arizona. In 1995, groundwater withdrawal in the Phoenix Active Management Area (AMA) supplied 39 percent of the total consumption of 2.29 million acre-feet (Arizona Department of Water Resources [ADWR] 1999). About 64 percent of the groundwater withdrawal was used for agriculture. The remainder was used for public water supply, industrial, domestic, and other purposes. Rapid population growth has resulted in the retirement of agricultural land and the conversion of agricultural groundwater supplies to urban uses. The availability of a suitable quality and quantity of water has influenced the development of cities and reduced the amount of agricultural land.

Issues created by groundwater overdraft include decreased water levels in aquifers and increased well drilling and pumping costs. Water quality may be an issue if groundwater pumped from greater depths contains more salts and minerals. In areas of severe groundwater depletion, the earth's surface may also subside, causing cracks or fissures that can damage roads, building foundations, and underground infrastructure.

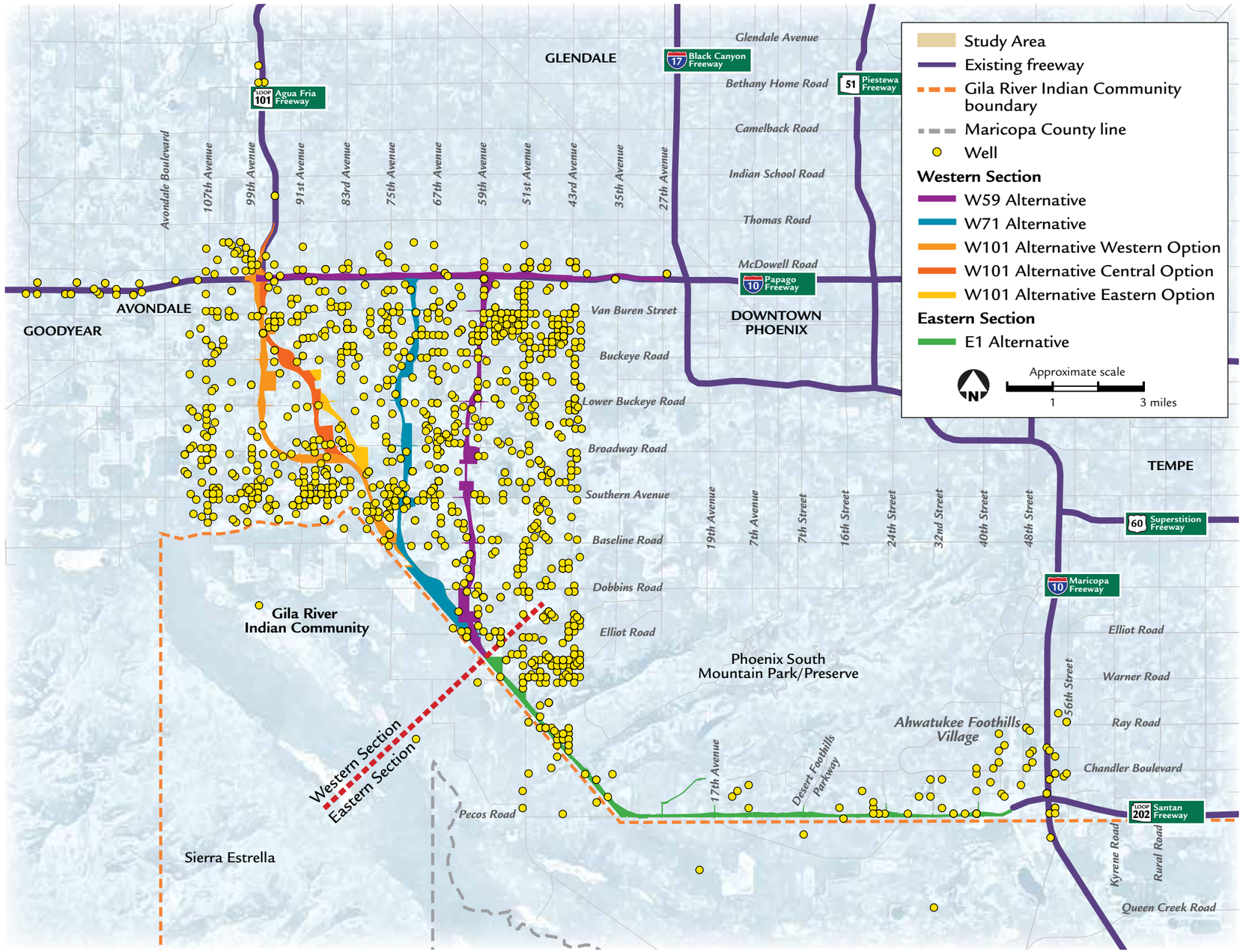
Figure 4-32 Watersheds in the Region



The Gila River Basin, which includes the drainages of the Salt and Verde rivers, is the primary influence on water resources in the Study Area.

The Study Area is located within two AMAs, each regulated by the State of Arizona through the Groundwater Management Act (ADWR 2011). Most of the Study Area is located in the Phoenix AMA. ADWR administers groundwater use through implementation of five successive management plan periods that will

Figure 4-33 Study Area Active Groundwater Wells



Extensive data gathering was undertaken to identify active wells in the Study Area. The wells serve varying purposes, from irrigation supply to drinking water supply.

result in a safe yield by 2025. *Safe yield* is the amount of groundwater pumped from AMA aquifers on an average annual basis and must not exceed the amount that is naturally or artificially recharged. Such an exceedance would "mine" the resource, i.e., deplete the water resource at an unsustainable rate. Water level declines in one subbasin of the Phoenix AMA can be offset by recharging water in another subbasin of the AMA. A small portion of the Study Area is located within the Pinal AMA. ADWR's management goal for the Pinal AMA is to preserve its agricultural economy for as long as feasible, while considering the need to preserve groundwater for future nonirrigation uses (ADWR 2011).

ADWR regulates the drilling, installation, and abandonment of groundwater wells. ADWR maintains a database containing annually updated well information. Active groundwater wells are located in the Study Area (Figure 4-33) (ADWR 2013).

The Roosevelt Irrigation District (RID) uses surface water and groundwater supplies and receives WWTP effluent from the City of Phoenix. Of the total amount of groundwater pumped by RID, approximately 85 percent is pumped from its well field in the southwestern portion of the SRP service area, just east of the Agua Fria River. RID annually purchases about 5,000 acre-feet of effluent from the City of Phoenix's 23rd Avenue WWTP. In addition, RID began annually taking 30,000 acre-feet of effluent from the City of Phoenix in 1995 through a water exchange agreement (City of Phoenix 2000).

SRP uses both surface water and groundwater pumped from its wells to meet its total delivery obligations.

The Buckeye Water Conservation and Drainage District (BWCDD) uses surface water and groundwater supplies, and receives WWTP effluent from the City of Phoenix. Groundwater makes up 12 to 18 percent of the total water supply for the BWCDD. In addition, up to approximately 40,000 acre-feet of effluent produced by the City of Phoenix's 91st Avenue WWTP is used by the BWCDD. The balance of water supply deliveries is from surface water diverted from the Gila River.

The irrigation districts in the Study Area (RID, SRP, and BWCDD) use groundwater wells and have both surface (canals) and subsurface (pipes) conveyance infrastructure associated with their operations. In addition, there are private, municipal, utility, and corporate-owned groundwater wells in the Study Area.

Groundwater Quality

Use of groundwater is limited by both the total content and the type of salt and mineral solids dissolved in the water. Generally, in the greater Phoenix metropolitan area, water containing more than 1,000 milligrams per liter (mg/L) of total dissolved solids is generally not preferred for potable water supply without treatment; water containing as much as 3,000 mg/L is, however, used for irrigation. The EPA secondary maximum contaminant level (SMCL)[35] (nonenforceable) for total dissolved solids is 500 mg/L for potable water supplies.

Groundwater quality in the Study Area generally satisfies existing EPA standards for drinking water, although the maximum contaminant level for nitrate (10 mg/L) and the EPA nonenforceable SMCL for dissolved solids is exceeded (U.S. Geological Survey [USGS] 2009). The West Van Buren Water Quality Assurance Revolving Fund (WQARF) site extends east-to-west beneath the Study Area between Van Buren Street and Buckeye Road. The WQARF site is regulated by ADEQ, and water quality in several of the groundwater well locations exceeds standards for VOCs (ADEQ 2006).

The following describes groundwater levels and general groundwater quality in the Western and Eastern Sections.

Western Section

- **Groundwater levels** – In the western portion of the Western Section, the depth-to-groundwater level varies from approximately 65 to 134 feet below ground surface, as reported by USGS for five measured wells from 1991 to 1997. In the north-central portion of the Western Section, near the Salt River, the depth-to-groundwater level ranges from 35 to 50 feet below ground surface, according to data collected from five wells from 1982 to 1992. In the southern portion of the Western Section, near Laveen Village, USGS data collected from four wells from 1923 to 1992 indicate the depth-to-groundwater level ranges from 9 to 40 feet below ground surface.
- **Groundwater quality** – In the western portion of the Western Section, USGS sampling results from five wells from 1951 to 1997 indicated that all five wells exceeded the EPA SMCL for chloride, which is 250 mg/L. Two of the wells also exceeded the maximum contaminant level for nitrate. In the north-central portion of the Western Section, near the Salt River, data collected from four wells from 1933 to 1997 show that all four wells exceeded the EPA SMCL for chloride and sulfate. The SMCL for both constituents is 250 mg/L. Two of the wells also exceeded the maximum contaminant level for nitrate. In the southern portion of the Western Section, near Laveen Village, USGS data collected from four wells from 1923 to 1992 revealed the SMCL for chloride and sulfate was exceeded in each of the wells. The maximum contaminant level for nitrate was exceeded in two of the four wells.

Eastern Section

- **Groundwater levels** – USGS groundwater level data (2009) in Ahwatukee Foothills Village were obtained for several wells from 1972 to 1992. Groundwater in this area is relatively deep, ranging from 97 to 117 feet below ground surface.
- **Groundwater quality** – Groundwater quality data from four wells from 1974 to 1983 indicated that the SMCL for chloride and sulfate was exceeded in each well (USGS 2009).

ENVIRONMENTAL CONSEQUENCES

This section describes water resource-related impacts that could result from the proposed action, including increases in sediment loading into receiving watercourses, release of pollutants generated by traffic, and erosion of unprotected banks. Impacts on water resources from construction activities are also discussed in the section, *Temporary Construction Impacts*, beginning on page 4-173.

Action Alternatives, Western and Eastern Sections

Surface Water

Regardless of the action alternative, pavement for the new road would increase the amount of impervious surface area, thereby increasing runoff quantities and peak flows during storms. Because the road surface would be impermeable, precipitation on the road would drain to catch basins and then to nearby natural channels. The increased runoff from the new impervious freeway surfaces would increase the transport of pollutants generated by vehicles using the freeway. This runoff would be transported from the road surface by the initial runoff generated during a storm. The most common impact would be the increase in pollutant loading into receiving waters. The action alternatives would concentrate vehicular traffic and the associated accumulation of pollutants throughout the road corridor. The total amount of road-related pollutants would be similar for each action alternative.

Mitigation, described in the section, *Mitigation*, beginning on page 4-106, would reduce long-term impacts on water quality from operation of the road. In addition, the action alternatives would decrease regional and commuter traffic on the local road network. Runoff from the completed project would be directed to existing and new drainage facilities. Existing drainage facilities with inadequate capacity would be improved to handle increased runoff flows. New runoff detention facilities might be required in some locations to limit the maximum rate of runoff released to existing drainage facilities.

Several reaches of the Salt and Gila rivers are on the CWA Section 303(d) list, including that portion of the Salt River in the Study Area (ADEQ 2011). Increased pollutant loading from freeway operation might further impair listed reaches of the Salt River and might need measures in addition to existing permit controls to achieve or maintain water quality standards in accordance with CWA Section 303(d).

Construction activities such as clearing, grading, trenching, and excavating would disturb soils and

Ephemeral washes

An ephemeral wash has flowing water only during and for a short period following precipitation. Such washes are located in low areas and may or may not have well-defined channels. The washes are located above the water table year-round, so groundwater is not a source of water. Runoff from rainfall is the primary source of water for water flow.

Table 4-41 Potentially Affected Wells, Action Alternatives

Alternative/Option	Number of Wells
Western Section	
W59 Alternative	94
W71 Alternative	30
W101 Alternative Western Option	48
W101 Alternative Central Option	32
W101 Alternative Eastern Option	30
Eastern Section	
E1 Alternative	27

sediment. If not managed properly, disturbed soils and sediments can easily be washed into nearby water bodies during storms, where water quality is reduced.

Groundwater

Operational impacts on existing wells may include restricted access to the well casing or head, restricted use of the well, and safety issues associated with access to or use of the well. If a well were adversely affected by freeway operation, well abandonment and compensation (e.g., drilling a new well) may be required. According to ADOT's Right-of-Way Group, if the well were acquired, the water would be replaced. This would be accomplished through well replacement (drilling a new well in compliance with the 2006 ADWR well spacing and well replacement rules), or by well abandonment and compensation (if requested by the owner). Canal, ditch, well, or pipeline replacements may be needed.

All action alternatives could affect existing wells located within the proposed R/W (ADWR 2013). A field verification of wells would be conducted prior to construction of any action alternative.

Table 4-41 shows the number of wells potentially affected by each action alternative. This table was developed using information obtained from the ADWR database, which identifies wells as monitoring, piezometer, production, geotechnical, observation, domestic, test, irrigation, and abandoned. Abandoned wells have been included in the totals provided in Table 4-41. If a well were adversely affected by roadway construction, well abandonment and compensation (e.g., drilling a new well) may be required (see text box on page 4-108 for additional information).

Action Alternatives, Western Section

Surface Water

In addition to the impacts identified as common to all action alternatives, the Western Section action alternatives would cross the Salt River and encroach into a federally mapped floodplain. If an action alternative were to become the Selected Alternative, runoff would be directed to drainage facilities that ultimately discharge to the Salt River. This runoff could temporarily increase contaminant concentrations in the river during periods of seasonal runoff. The impact of pollutant discharges to water quality would be directly proportional to traffic volumes on the proposed freeway.

Impacts on surface water (i.e., the Salt River) would depend on time of year and any associated flows. The Salt River bed is dry most of the year because of upstream flow diversions and SRP restrictions. If an action alternative were to become the Selected Alternative, however, a SWPPP would be prepared and would contain site-specific BMPs. In addition, the AZPDES permit would be consistent with discharge limitations and water quality standards established for the receiving water.

Several irrigation district conveyance canals, ditches, and pipelines would be crossed by the Western Section action alternatives (Figure 4-34). Impacts such as runoff discharge from the roadway to the irrigation district canals and conveyance ditches would be minimized by roadway design and the use of BMPs.

Groundwater

Affected wells that would need to be fully replaced (by drilling a new well) would be required to comply with the 2006 ADWR well spacing and well replacement rules pursuant to A.R.S. § 45-454(c). The rules, collectively called "well spacing rules," establish criteria for well spacing for certain new wells and well uses and define what constitutes a replacement well in approximately the same location.

Action Alternative, Eastern Section

Surface Water

In addition to the impacts identified as common to all action alternatives, the E1 (Preferred) Alternative could affect receiving water quality in the Gila River. Discharges of pollutants to ephemeral washes and, ultimately, to the Gila River would occur as a result of storms. The drainage design features of the E1 Alternative would be such that drainage patterns from the South Mountains toward the Gila River would not be altered. Currently, drainage flows generally from the north to the south, passing under Pecos Road through a series of culverts following natural drainages/washes. The E1 Alternative would include small drainage basins and channels on the northern side of the freeway to treat the water quality and meter and direct drainage flows under the freeway and onto Community land in the same manner as they are currently.

Groundwater

Affected wells that would need to be fully replaced (by drilling a new well) would be required to comply with the 2006 ADWR well spacing and well replacement rules pursuant to A.R.S. § 45-454(c). The rules, collectively called "well spacing rules," establish criteria for well spacing for certain new wells and well uses and define what constitutes a replacement well in approximately the same location.

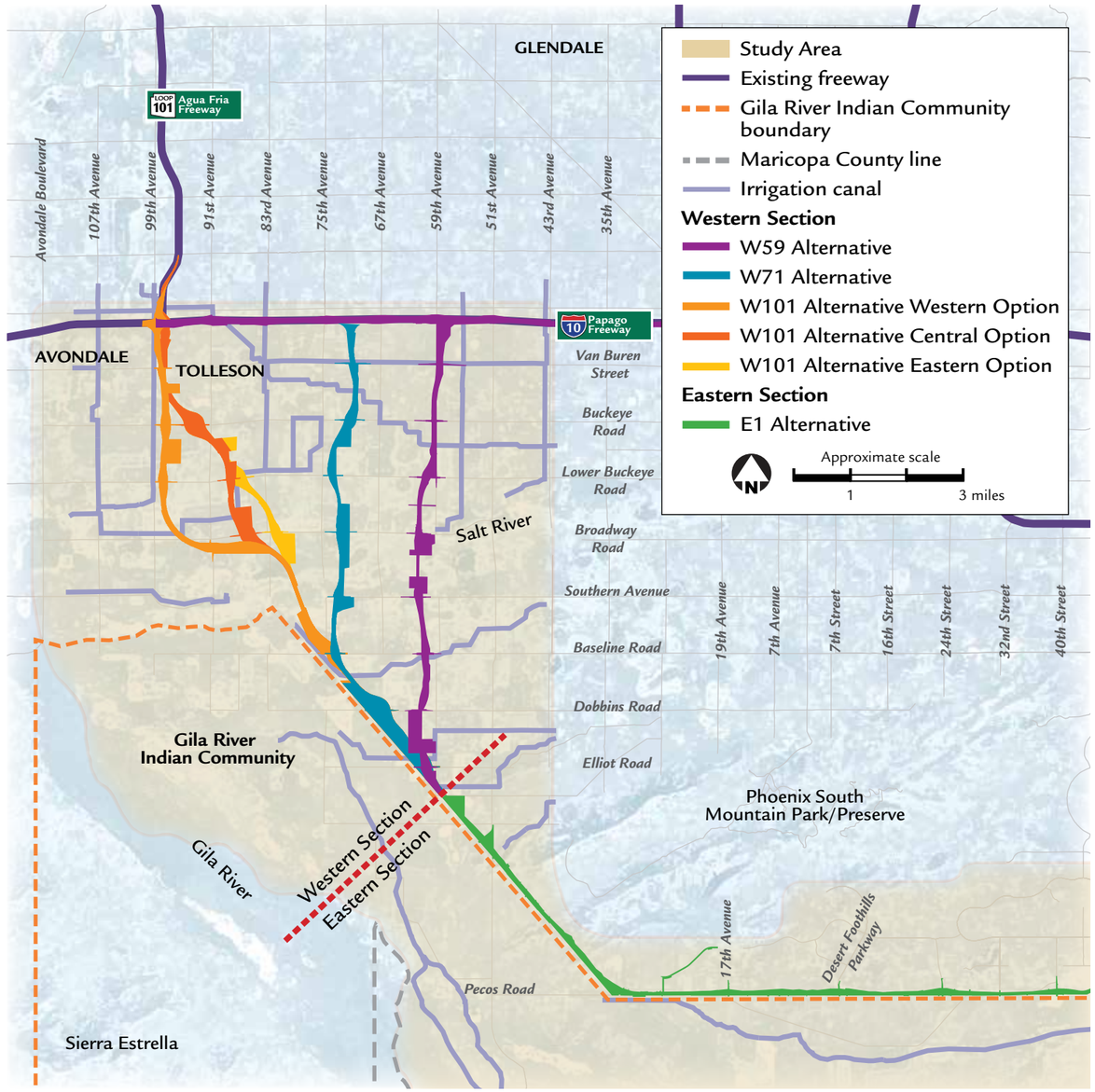
No-Action Alternative

Project-related water quality impacts would not occur as a result of the No-Action Alternative. There would be no construction that could create project-related erosion or sediment deposits in existing watercourses or that could alter the existing groundwater. Because no new freeway facility would exist in the Study Area, pollutants associated with increased road runoff would not occur. As urban growth continues, traffic volumes would, however, likely increase on surface streets. As a result, pollutants would continue to be generated by the increased traffic on the surrounding road system and be dispersed over a larger area. Storms may cause erosion of exposed soil surfaces and subsequent runoff of sediment-laden water.

MITIGATION

None of the action alternatives would completely avoid causing impacts on water resources because any freeway in the southwestern Phoenix metropolitan area connecting to I-10 (Maricopa and Papago freeways) would cross the Salt River and ephemeral washes.

Figure 4-34 Irrigation Canals



An extensive network of irrigation canals is indicative of the region's long agricultural history.

ADOT Design and Environmental Planning Group Responsibilities

Mitigation to reduce the quantity of pollutants reaching the Gila and Salt rivers is inherent in the design of the proposed freeway. All action alternatives would have properly designed roadway channels to resist erosion, energy-dissipating structures at all culverts where discharge velocity may cause downstream erosion, and sediment-trapping basins strategically located to maximize sediment removal and to function as chemical-spill containment structures.

Vegetative or mechanical means would be used to minimize erosion from cut and fill slopes. Vegetation would slow surface runoff, help bind soils, reduce raindrop impact, and break up flow patterns. Mechanical means include retaining walls, rock slope protection, and geotextiles such as matting. Where appropriate, retaining walls would decrease cut and fill slopes, which, in turn, would reduce runoff velocities and erosion potential. Rock slope protection, where placed, would armor the slope, thereby preventing soil movement. Geotextiles would prevent extensive contact between surface runoff and soil, keeping the soil intact.

Slopes along roadside channels and at discharge points from culverts may be steep, promoting erosion. Therefore, conveyance features may need protection in the form of channel lining, reduced slopes, or energy-dissipating structures. Impacts such as runoff discharge from the road to the irrigation district canals (east of 51st Avenue in the Eastern Section) and conveyance ditches would be minimized by roadway design and the use of BMPs.

To reduce the potential impact of contaminants such as oil, grease, soil, and trash, settling basins would be used to collect water and allow materials to settle. The basins could also serve to contain chemical spills resulting from vehicle accidents. Each basin would be designed to contain a certain rainfall runoff volume before allowing discharge. If an accident were to occur, and the basins were dry at the time of the accident, the spill volume, in most cases, could be accommodated. These settling basins would require

Process to Find Replacement Water

In the area north of Pecos Road and west of 24th Street, the Foothills Community Association (FCA) owns a well that is used to provide irrigation water stored in five lakes distributed throughout the area. The proposed freeway alignment would likely necessitate acquisition of this well for the roadway R/W.

Members of the public expressed concerns about the loss of this well to the area. According to comments received, several wells have been drilled in the area and have either produced small amounts of water or no water. Because the FCA well is the highest-capacity well owned by the association and is associated with grandfathered water rights, its replacement would be considered vital to the FCA; therefore, clarification was requested regarding ADOT's process for assessing the value of the existing well and the procedures for well replacement.

The FCA's well (ADWR Identification No. 55-630347) is a part of the lake system that provides physical and aesthetic amenities to Foothills-area residents and to the golf course. According to the *Foothills Lake System Study* (FCA 1996), the well has a high capacity, capable of producing 730,000 gallons of water per day (gpd). The well is an integral part of the five-lake system, which 1) provides and stores irrigation water, 2) serves as an aesthetic feature, and 3) provides stormwater detention for area drainage. The lakes are interconnected by pressure and gravity piping, which allows water to be pumped to the lakes for storage and provides circulation as well as operational flexibility.

The *Foothills Lake System Study* states that the lakes are supplied by three water sources: reclaimed wastewater, groundwater from wells, and potable water supplied by the City of Phoenix. However, wastewater effluent is no longer available as a replacement source. The City of Phoenix did operate a wastewater reclamation facility in this area, but it was removed from service and demolished. The City of Phoenix still owns the property, but all facilities have been removed from the site. Thus, only two water sources are available for irrigation and lake supply for the FCA: the well that would be acquired and potable water from the City of Phoenix. Irrigation of the golf course needs approximately 300,000 gpd in the winter and between 1.2 and 1.4 million gpd in the summer months. The lakes were designed with excess capacity that allows runoff to be stored. After a storm, water can be released at overflow points or be used to irrigate the golf course by being drawn down gradually.

The priority of water consumption for irrigation and maintenance of lakes is to first use all well water available, and then, if necessary, to use City of Phoenix potable water as a last resort. The high-capacity well that may be acquired by the project and a second well (No. 55-630348, which has a capacity of 76,000 gpd and is not in jeopardy of acquisition) have Type 2 nonirrigation grandfathered water rights that allow a total of 45 acre-feet of groundwater to be withdrawn per year (40,176 gpd). According to the Arizona Groundwater Code, Type 2 rights can be used only for a nonirrigation purpose. The right is based on historical pumping of groundwater for a nonirrigation use and equals the maximum amount pumped in any one year between 1975 and 1980. Examples of nonirrigation uses include industry, livestock watering, and golf courses. Type 2 rights are the more flexible type of water rights because they may be sold separately from the land or well. In addition, the owner of Type 2 rights may, with ADWR approval, withdraw groundwater from a new location in the same AMA. It is possible to lease a portion of Type 2 rights, but if the rights are sold, they may not be divided; instead, the entire rights must be sold.

Depending on whether an action alternative were to become the Selected Alternative, it may be possible to keep certain wells in their current location, but move the well controls and associated piping to outside of the R/W. Such an analysis would be performed later in the design process.

If the well were to be acquired, the water would be replaced, which could occur in a number of ways. Some of the methods of water replacement are summarized below.

ADOT's first choice would be replacement of the acquired well. ADOT prefers to pay well owners to replace the acquired well. This would involve negotiations with the well owner and a payment to the owner for associated replacement well costs. These costs could include, but not necessarily be limited to:

- costs of any hydrologic studies that may be required
  - according to ADWR regulations, if the replacement well is relocated within 660 feet of the existing well, no hydrologic study would be required; it is unknown at this time whether a new well could be located to meet this criterion; however, hydrologic studies may be required to determine the best location for a new well
- costs of exploratory drilling and final well development
- costs of reconnecting the new well to the lake system

ADOT's next choice would be to hire a contractor to perform the necessary studies on well placement and to drill a new well (not considered a replacement well by ADWR and assumed to be farther than 660 feet from the original well location). The well would then be provided to the owner of the acquired well. The preference would be to locate the new well on the former well owner's property; if additional R/W would be needed for the new well location, however, these costs would be included in negotiations. It is assumed that a new well location could be found that would produce water comparable in quality and quantity to the acquired well and that no change in the existing groundwater right would result.

It is understood that finding a suitable location for a new well in this area may be difficult. In the event that well replacement were not possible, ADOT would still replace the water that would be lost through the acquisition. As noted earlier, City of Phoenix potable water is available as a replacement water source. If well replacement were to be impossible, alternative sources of water may be provided. These replacement water sources would probably prove more costly than the pumping of wells; therefore, the difference between the costs of pumping the well and the new water source would be included in ADOT's negotiations with the well owner. In addition, the existing Type 2 water rights held by the FCA have value, and these rights could conceivably be lost if the well were not replaced. ADOT and the FCA would have to assign a value on the loss of the water rights, and this value would be included in the negotiations.

periodic cleaning and would be accredited as part of the Statewide Stormwater Management Program.

If an action alternative were to become the Selected Alternative, a construction AZPDES permit, for ground-disturbing activities exceeding 1 acre, would be obtained from ADEQ in accordance with the provisions set forth in Section 402 of the CWA (ADEQ 2013). The AZPDES permit must be consistent with discharge limitations and water quality standards established for the receiving water. Construction-related activities regulated under the permit are required to have a SWPPP, which would be prepared by the contractor.

To control construction-related pollution discharged to waters of the United States as defined in the CWA, ADOT would prepare erosion and sediment control plans, details, and specifications (see the section, *Waters of the United States*, beginning on page 4-116) set forth in the ADOT *Erosion and Pollution Control Manual for Highway Design and Construction* (ADOT 2012c). The contractor would use ADOT's project erosion and sediment control plans, details, and specifications to guide development of a SWPPP. BMPs set forth in the project erosion and sediment control plans, details, and specifications would be included in the contractor's SWPPP.

BMPs may include:

- Silt barriers (silt fences, compost-filled socks, or straw barriers) would be constructed to restrict and filter sediment flowing to off-site channels.
- Trapped silt and debris would be removed to an off-site location before removing barriers.
- Contamination from leaking equipment would be reduced or prevented through frequent construction equipment inspections. Faulty equipment would be repaired when discovered.
- Construction equipment would be cleaned on a regular basis to minimize potential runoff contamination from petroleum products.
- Sediment basins would be constructed to treat sediment-rich runoff before discharge to off-site drainage channels.

- Equipment would be fueled and serviced at designated locations to minimize work site contamination. These fueling locations would be located away from nearby channels, swales, or other features that would quickly facilitate movement in the event of a spill.
- Upon construction completion, all contaminated material (e.g., concrete wash water) would be removed and disposed of in accordance with local, regional, and federal regulations.

Implementation of BMPs associated with any of the action alternatives would reduce water quality impacts on the receiving waters of the Salt and Gila rivers. Both construction and operational impacts may be mitigated through the use of BMPs. ADOT EPG would also secure the CWA Section 401 certification by ADEQ.

ADOT would coordinate with appropriate governmental bodies such as flood control districts and the Community when designing drainage features for the proposed action (see the section, *Drainage*, on page 3-58).

ADOT Right-of-Way Group Responsibilities

Existing groundwater wells within the proposed R/W may be abandoned or replaced, as necessary. New wells would be installed outside the proposed R/W in accordance with ADWR regulations. Groundwater wells can be replaced within 660 feet of the original location without a hydrogeologic analysis (ADWR 2006). If a well were affected by roadway construction, the well owner would maintain rights for the water (see text box on previous page). According to ADOT's Right-of-Way Group, if the well were acquired, the water would be replaced. This would be done through full well replacement (drilling a new well, in compliance with the 2006 ADWR well spacing and well replacement rules) or well abandonment and compensation (if requested by the owner).

Affected existing irrigation district canals may be relocated to allow for conveyance of irrigation water (through installation of pipe, conduit, or extension) from one side of the freeway to the other.

ADOT District and Contractor Responsibilities

To control construction-related pollution discharges to waters of the United States as defined in the CWA, ADOT would prepare erosion and sediment control plans, details, and specifications using BMPs from the ADOT *Erosion and Pollution Control Manual for Highway Design and Construction* (ADOT 2012c) and the ADOT *Post-Construction Best Management Practices Manual for Highway Design and Construction* (ADOT 2013).

The contractor would use ADOT's project erosion and sediment control plans, details, and specifications as a guide in developing a SWPPP. BMPs set forth in the project erosion and sediment control plans, details, and specifications would be included in the contractor's SWPPP. The contractor would file a Notice of Intent and a Notice of Termination with ADEQ in accordance with Section 402 of the CWA and provide copies of the permit authorization to ADOT. ADOT would also comply with the State of Arizona Surface Water Quality Standard Rules (18 A.A.C. § 11).

The project would be located within designated MS4s. Therefore, the contractor, in association with the District, would send a copy of the certificate authorizing permit coverage and a copy of the Notice of Termination acknowledgement letter to the ADOT Environmental Services Water and Air Quality Group, Glendale, Phoenix, Chandler, Goodyear, Tolleson, and Avondale as appropriate based on the location of project activities.

Other measures that ADOT would undertake include:

- improving surface water quality when the freeway would be open to operation by proper maintenance of the retention, detention, and stormwater runoff facilities
- mitigating, as previously outlined, for wells that may be adversely affected during construction
- conveying affected irrigation ditches through pipe under the roadway
- relocating existing irrigation district canals that may be affected by the proposed action to allow for conveyance of irrigation water (through installation of pipe, conduit, or extension)

CONCLUSIONS

With implementation of any of the action alternatives, runoff from the action alternatives themselves would temporarily increase pollutant loading in surface water drainage during periods of seasonal runoff. Pollutant loading would be greatest with implementation of the W101 Alternative/E1 Alternative, primarily because the combined Western Section/Eastern Section action alternative would introduce the greatest amount of impervious surface into the Study Area. The differences in pollutant loading among action alternatives would be minor and the impacts from pollutant loading would be typical of such impacts experienced throughout the region's freeway system. Impacts would be effectively mitigated through the AZPDES and SWPPP permitting processes.

In the Eastern Section, runoff from the South Mountains passes under Pecos Road through a series of culverts following natural drainages/washes. The design of the E1 Alternative would alter the drainage pattern by use of a series of drainage detention basins to direct runoff to specific locations to discharge under the proposed freeway and onto Community land (see the section, *Drainage*, on page 3-58). Under the No-Action Alternative, increased traffic volumes on surface streets would contribute to increased pollutant loading dispersed over a larger area.

Additionally, implementation of any of the action alternatives would alter water well access or may require well abandonment. The W101 Alternative Eastern Option/E1 Alternative (when combining the Western and Eastern Sections) would potentially affect 57 wells, the least of any action alternative; the W59 Alternative/E1 Alternative (Preferred Alternative) would potentially affect 121 wells, the most of any action alternative. The number of wells potentially affected would be consistent with that of a project the magnitude of the proposed action, and the well replacement program as outlined by State law has been regularly implemented by ADOT to effectively mitigate well impacts associated with its projects throughout the region.

4

FLOODPLAINS

AFFECTED ENVIRONMENT

A *base flood*, commonly referred to as a 100-year flood, is caused by a flood with a probability of occurring once every 100 years. The area where it occurs is referred to as the 100-year floodplain. To identify the locations and extent of the 100-year floodplains in the Study Area, two data sources were used. First, the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps were reviewed to determine the relationship of the proposed action to the boundaries of 100-year floodplains. Second, in areas where FEMA floodplain mapping was not available, geomorphology was used to identify and delineate any 100-year floodplains.

Because of the lack of FEMA floodplain mapping for the Gila River on Community land, geomorphology and aerial photography provided the best sources of data for analysis. Geomorphology is a type of geology that examines the structure of features along the ground surface. Geomorphologic analysis provided an understanding of the Gila River on Community land and the way the river might respond to imposed change, such as the influence of vegetative cover patterns, stream flow changes, and erosional and depositional changes (Rosgen 1996). Review of historical geomorphologic surveys and aerial photographs indicates a relatively stable Gila River channel profile over the last 90 years (Waters 2001).

An *encroachment* is an action within the limits of the 100-year floodplain. The regulatory floodway is the portion of the floodplain area reserved by federal, State, and/or local requirements in an unconfined and unobstructed manner to provide for discharge of a base flood so that the overall increase in water surface elevation is no more than 1 foot (not a significant increase), as established by FEMA. It is normally the channel defined by the ordinary high water mark (OHWM). Development in the floodway is allowed if it can be demonstrated that no rise in the base flood elevation will occur (Association of State Floodplain Managers 2003).

Existing Conditions

The FEMA Flood Insurance Rate Maps include Special Flood Hazard Areas (SFHAs), which are the 100-year floodplains. SFHAs are also areas where the National Flood Insurance Program floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies. SFHAs applicable to the proposed action are:

- **Zone A:** Areas subject to inundation by a 100-year flood that are generally determined using approximate methodologies. Detailed hydraulic analyses have not been performed; therefore, no Base Flood Elevations or flood depths are shown.
- **Zone A99:** Areas subject to inundation by a 100-year flood, but which will ultimately be protected from flooding upon completion of an under-construction federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, or levees, to consider the system complete for insurance rating purposes. Zone A99 may be used only when the flood protection system has reached specified statutory progress toward completion and when neither Base Flood Elevations nor depths are shown.
- **Zones AE and A1-30:** Areas subject to inundation by a 100-year flood that are determined by detailed methodologies. Base Flood Elevations are shown.
- **Zone AH:** Areas subject to inundation by shallow flooding under a 100-year flood (usually areas of ponding) where average depths are between 1 and 3 feet. Base Flood Elevations derived from detailed hydraulic analyses are shown in this zone.
- **Zone AO:** Areas subject to inundation by shallow flooding under a 100-year flood (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Some Zone AO sites have been designated in areas with high flood velocities such as alluvial fans and washes.
- **Zone AR:** Areas resulting from the decertification of a previously accredited flood protection system that have been determined to be in the process of being restored to provide base flood protection.

Moderate flood hazard areas are also shown on the Flood Insurance Rate Maps as Zone X. These are areas between the limits of the 100- and 500-year floodplains. Other flood areas labeled Zone X are areas of minimal flood hazard (areas outside the SFHA and higher than the elevation of the 500-year floodplain).

Areas in which flood hazards are undetermined, but possible, are shown as Zone D.

The Study Area crosses three 100-year floodplains. These are associated with an area north of the UPRR tracks that is intersected by an irrigation canal, the Salt River, and the Gila River (Figure 4-35).

A 100-year floodplain is located on the northern side of the UPRR tracks between 107th and 69th avenues. At approximately 73rd Avenue, the RID Canal crosses the railroad tracks, and an associated levee creates discontinuous 100-year floodplain areas north of the canal until it intersects with the Salt River floodplain to the east, outside of the Study Area. The SFHAs associated with this 100-year floodplain include Zones AH, AE, and X.

Because of dams and water diversions upstream of the Study Area, the Salt River is dry under normal hydrologic conditions. Floodplain widths along the Salt River vary from 1,900 feet near 79th Avenue to more than 7,000 feet in other Western Section Study Area locations. The SFHAs associated with this 100-year floodplain include Zones AH and X. The widest portions of the floodplain are associated with ponding that occurs in ineffective flow areas. The narrowest portions are where the floodwater conveyance is highest and the floodplain is contiguous with the floodway. The floodway width for the Salt River varies from 1,200 feet just upstream of 75th Avenue to 3,000 feet near the confluence with the Gila River.

FEMA mapping does not extend onto Community land upstream of the Gila River's confluence with the Salt River. The upstream areas (from the Salt River and Gila River confluence) are shown on the *Surficial Geologic Map of the Gila River Indian Community, Arizona* (Waters 2001). The streambed alluvium (designated T-0) and Holocene Terrace (T-1) geomorphology correspond with the floodplain mapping at the confluence of the Gila and Salt rivers. Determination of specific flood hazards is difficult because of limited information, which includes the *Surficial Geologic Map of the Gila River Indian Community, Arizona*, topographic information, and existing drainage studies. Areas downstream of the confluence of the Salt and Gila rivers—south of Baseline Road and west of 99th Avenue—are mapped as Zone D.

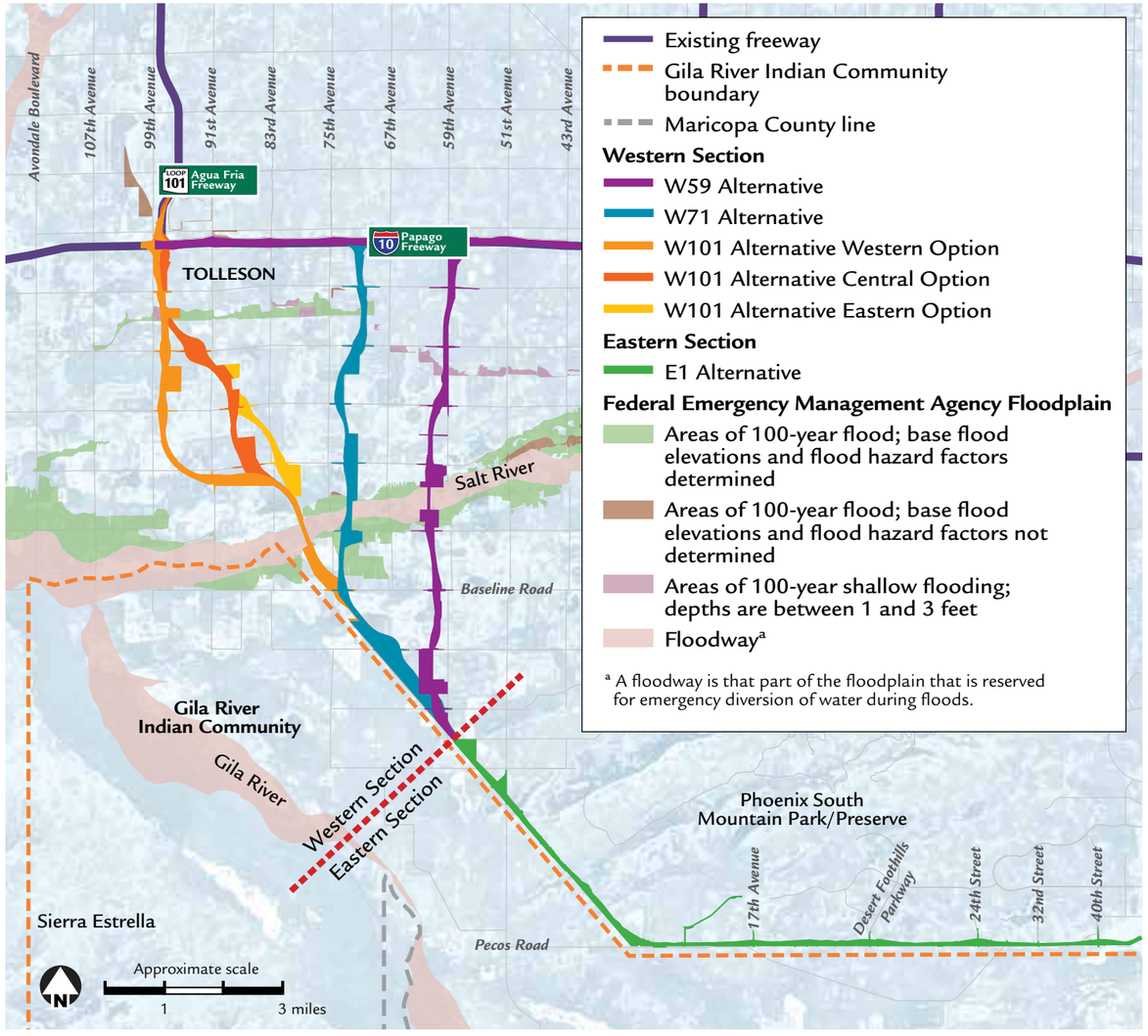
Watercourse Descriptions

Salt River

The Salt River is the largest tributary in the Gila River Basin, with its headwaters in rugged mountain terrain at elevations exceeding 7,000 feet in northern Arizona. The Salt River enters the Gila River at the western edge of the greater Phoenix metropolitan area. The Salt River watershed is approximately 5,980 square miles in size. Prior to construction of upstream water supply dams, the Salt River was perennial. Historical records indicate the Salt River had a wide, braided channel and experienced annual floods. Above its confluence with the Gila River, the Salt River has estimated 100- and 500-year peak discharge capacities of 162,000 cubic feet per second (cfs) and 235,000 cfs, respectively (USACE 2000).

Throughout the Study Area, flows in the Salt River are controlled by six upstream water supply and hydropower dams operated by SRP. Only the Roosevelt Dam, on the Salt River, now has allocated flood control storage that may be used to diminish peak flood flows through controlled releases. The other dams must release water in anticipation of flood flows to provide any attenuation. The Salt River largely remains dry downstream of the dams. In addition, during the past two decades, the riverbed has undergone substantial changes because of urbanization and sand and gravel mining. These activities have generally narrowed and deepened the main channel. In some portions of the Salt River, water has been reintroduced. Examples of this include development of Tempe Town Lake and construction of the City of Phoenix 91st Avenue WWTP. In 1999, the City of Tempe impounded the Salt River behind an innovative, inflatable rubber dam to create the 200-acre Tempe Town Lake. In times of high upstream discharges from the reservoirs, the dam can be rapidly deflated to allow peak flows to pass into the main channel.

Figure 4-35 100-year Floodplains



The Salt River floodplain is the more prominent of the two delineated floodplains in the Study Area.

Gila River

The reach of the Gila River upstream of the Salt River confluence and downstream of the Coolidge Dam (San Carlos Reservoir) has a watershed characteristic of the Basin and Range lowlands province. The Gila River watershed (located in Arizona and New Mexico) is approximately 57,900 square miles in area. Two dams on the Gila River system, upstream of the Salt River confluence, help regulate flow. Coolidge Dam, primarily a water supply dam, is located on the Gila River upstream of the confluence of the San Pedro and Gila rivers. Tat Momolikot Dam is a flood control facility located on Santa Rosa Wash. The estimated 100-year discharge capacity for the Gila River, downstream of the Salt River confluence, is 227,000 cfs (USGS 1989).

The Gila Drain is an SRP irrigation return flow channel that discharges to the Gila River. The Gila Drain conveys minor flood flows and irrigation tailwater from areas northeast of the Study Area into the Study Area at I-10 and Pecos Road. Flows from the drain are ultimately discharged into the Gila River on Community land (ADOT 1998). Flows are captured in the Gila Drain, which passes east-to-west through the Study Area and under 51st Avenue south of St. Johns (Komatke), on Community land. Larger flows that cannot be contained in the Gila Drain can be expected to break out into the Gila Drain Floodway. The Gila Drain Floodway watershed includes outflow from the 48th Street Basin, SEVRDS/Santan Channel Detention Basin, and miscellaneous irrigation return water flows. The SEVRDS is part of a large watershed that drains the eastern portion of the Phoenix metropolitan area. The SEVRDS/Santan Channel intercepts the off-site flow originating in this watershed and ultimately discharges these flows to the Gila Drain Floodway. The detention facility provides treatment of "first-flush" stormwater to remove suspended sediment, nutrients, and other pollutants. Flows from the Gila Drain enter the Gila River west of the community of St. Johns (Komatke), on Community land.

Summary of Flooding Risk and Flooding History

Flooding risk is based on the potential for damage during a 100-year or lesser flood. Several factors unrelated to the proposed action may affect flooding risk. These include operation of the upstream reservoir system on the Salt River, future water resource facilities, and sand and gravel mining activities. Changes in water-related facilities include modifications completed in the late 1990s to Roosevelt Dam to increase its height and reservoir storage capacity. The increased height of the dam is intended to provide dedicated flood control storage for runoff from the upper Salt River Basin.

Major flows occur in the Salt and Gila rivers only when water is released from the upstream water storage facilities. These releases occur when runoff from the watershed is expected to exceed the capacity of the reservoirs. Smaller flows may result from storms within the watershed downstream of dams. Studies of rainfall and runoff relationships indicate that the greatest runoff quantities and resultant floods occur in the winter season. Floods of record within the watershed include:

- 300,000 cfs in 1891 on the Salt River prior to completion of the dams within the system
- 250,000 cfs in 1891 on the Gila River downstream of the confluence with the Salt River, at Gillespie Dam
- 212,000 cfs in 1980 on the Salt River (largest since construction of the dams within the system)
- 32,850 cfs in January 1993 on the Gila River upstream of its confluence with the Salt River (Maricopa County Department of Emergency Management 2005)
- 17,594 cfs in January 2010 on the Gila River downstream of the confluence with the Salt River, at 116th Avenue (FCDMC 2010)

Flood flows in the river systems continue to have the potential to alter the human-modified and natural landscapes. There have been five floods on the Salt River in excess of 100,000 cfs since 1978: 1978 (two), 1980, 1983, and 1993. Flood damage potential has been reduced by upstream dam improvements. Major 2004 winter storms (December) in the Salt River watershed prompted SRP to release 30,000 cfs from Granite Reef Dam into the Salt River, requiring the deflation of the Tempe Town Lake Dam. This was the first release into the Salt River since Tempe Town Lake was constructed. A second release from Granite Reef Dam began in the fall of 2010 to refill Tempe Town Lake after replacement of the last of the dam's four large rubber bladders. (One of the bladders failed and drained the lake at a rate of 15,000 cfs in July 2010. The other three bladders were also replaced under a planned replacement schedule.) The area at the confluence of the Gila and Salt rivers has experienced numerous floods, with property damage through inundation and scouring effects. Wildlife habitat restoration and associated flows from the 91st Avenue WWTP are being addressed through USACE, Los Angeles District (*Tres Rios Arizona Feasibility Report* [USACE 2000]).

Flooding in the northern portion of the Western Section of the Study Area is caused by the interception of sheet flow from the rise in ground elevation associated with the UPRR railbed and the RID Canal channel.

ENVIRONMENTAL CONSEQUENCES

Action Alternatives, Western Section

All Western Section action alternatives would affect floodplains. Two 100-year floodplains would be affected: one associated with the Salt River and one north of the UPRR tracks (referred to as the UPRR floodplain). FHWA policies and procedures for the location and hydraulic encroachments on floodplains are set forth in 23 C.F.R. § 650. This section of the FEIS summarizes the evaluation of the proposed action in relation to applicable provisions of those regulations, including flooding risks, impacts on natural and beneficial floodplain values, probable incompatible floodplain development, measures to minimize floodplain impacts, alternatives to encroachment, and the potential for significant encroachment.

All Western Section action alternatives would laterally cross the Salt River and UPRR floodplains. The Salt River has an associated federally mapped floodplain and regulatory floodway. The UPRR floodplain is federally mapped, but, unlike the Salt River floodplain, it is not associated with a regulatory floodway. There is no alternative to crossing the Salt River or the UPRR floodplain because both form a continuous east-to-west feature across the Study Area. All Western Section action alternatives would result in limited encroachment on the floodplain and limited flooding risk.

Table 4-42 lists estimates of floodplain encroachment for the W59 (Preferred) Alternative and the other Western Section action alternatives and options. The estimates of encroachment include all the area within the proposed R/W of each action alternative; thus, more than just the project footprint (e.g., that area occupied by freeway structures and fill needed to create or stabilize these structures) is included. The floodway acreage is included in the Salt River floodplain total.

The acreage estimates are the potential extent of encroachment if the roadway were completed entirely on embankment fill. The extent of encroachment is expected to be smaller than that shown in Table 4-42, which would further reduce flooding risk in the Study Area. The Salt River floodplain crossings would include bridges, and the UPRR floodplain crossings would include either bridges or flood mitigation structures, such as basins and diversion structures. Minor design modifications that could further mitigate floodplain impacts, if warranted, are typically considered during the design process.

The W101 Alternative would have the least overall floodplain encroachment potential. In addition, the W101 Alternative would have the least potential for encroachment on the floodplain associated with the Salt River. The W71 Alternative would have the greatest potential for encroachment on the UPRR floodplain. The W71 Alternative would also have the potential to encroach on the greatest amount of floodplain in the Study Area.

Risks Associated with the Proposed Action

Risks are the consequences associated with the probability of flooding attributable to encroachment. The mitigation measures described in the section, *Mitigation*, beginning on page 4-114, would minimize the potential for property loss or hazard to life. Developments south of the freeway in the Western Section would have a higher level of flood protection than now exists because the freeway off-site drainage system would be designed to collect runoff for up to a 100-year storm, which would protect the freeway from flooding and, additionally, anything downstream of the freeway.

Impacts on Natural and Beneficial Floodplain Values

Natural and beneficial floodplain values associated with the Salt River floodplain include:

- wildlife habitat
- open space
- scientific research opportunities
- outdoor recreation
- agriculture
- natural flood control
- mining and industry (building material source)
- water quality maintenance
- groundwater recharge

As previously mentioned, the Salt River has been substantially altered from its natural condition. Control of flow by upstream dams and reservoirs has resulted in the channel being dry throughout most of the year. Major flow occurs only when water is released from the upstream facilities. The dry channel has been subject to sand and gravel operations, which have further altered the channel configuration. These alterations can increase some beneficial values and decrease others, such as wildlife habitat.

Because of these altered conditions, freeway facilities would not further diminish the natural floodplain values. Open space and outdoor recreational opportunities would be preserved. Because of urbanization adjacent to the Salt River and the continuing sand and gravel mining operations, wildlife habitats in the affected areas are of low value. The ability for wildlife to move freely within the remaining habitat would continue because bridges associated with any of the action alternatives would not impede movement. Therefore, the proposed action would not diminish values of remaining habitat. Bridge piers would have a negligible impact on the floodplain's capacity for groundwater recharge. Other activities, within the definition of natural and beneficial values, are not known to occur in the affected areas. Therefore, the proposed action would have no such impacts.

Table 4-42 Estimated Acreage of Floodplain Impacts, Western Section, Action Alternatives

Action Alternative/ Option	Salt River Floodplain Encroachment[a]	Union Pacific Railroad Floodplain Encroachment[a]	Total Floodplain Encroachment[a]
W59	90	4	94
W71	117	10	127
W101 Western Option	19	33	52
W101 Central Option	19	29	48
W101 Eastern Option	19	29	48

Note: There are no designated floodplains in the Eastern Section.
[a] based on right-of-way footprints

Support of Incompatible Floodplain Development

The 100-year floodplain associated with the Salt River is dominated by agriculture, mining, and undeveloped open space. Each Western Section action alternative and option would be a controlled-access facility and would cross the 100-year floodplain with structures above the 100-year floodwater surface elevation. Floodplain management regulations are enforced by FCDMC, with statutory authority as prescribed under A.R.S. §§ 48-3603 and 48-3609. In addition, the action alternatives and options are consistent with existing

development plans of the City of Phoenix and Maricopa County (see the section, *Land Use*, beginning on page 4-3). The freeway would provide improved access to future development, which, in turn, would be consistent with floodplain regulations. The action alternatives would not contribute to incompatible floodplain development.

Measures to Minimize Floodplain Impacts

The measures described in the section, *Mitigation*, beginning on this page, would be effective in minimizing impacts associated with encroachments into 100-year floodplains.

Alternatives to Encroachment

Potential encroachments into 100-year floodplains are quantified in Table 4-42. Encroachments on the Salt River floodplain and the UPRR floodplain by any of the Western Section action alternatives and options were determined to be unavoidable. Both floodplains extend across the entire width of the Western Section of the Study Area. The location of the encroachments correlates to the established western logical terminus at I-10 (Papago Freeway) for any of the action alternatives and options.

Potential for Significant Encroachment

Significant encroachment, as defined in 23 C.F.R. § 650.105(q), Subpart A, would occur when the highway encroachment and any base floodplain development would involve one or more of the following construction or flood-related impacts:

- interruption or termination of a transportation facility needed for emergency vehicles or one that provides a community's only evacuation route
- significant risk
- significant adverse impact on natural and beneficial floodplain values

Regardless of action alternative, the proposed action would not have the potential to interrupt or terminate transportation facilities needed for emergency vehicles or emergency evacuation routes. The proposed action would neither create a substantial risk nor adversely affect natural or beneficial floodplain values. Therefore, the proposed action would not have a significant encroachment on floodplains.

Action Alternative, Eastern Section

The E1 (Preferred) Alternative would not cross any federally mapped floodplains. The Eastern Section action alternative would have no impact on floodplains in the Study Area.

No-Action Alternative

The No-Action Alternative would have no impact on floodplains in the Study Area. Growth projections supported by affected jurisdictions' planning policies for the Phoenix metropolitan area, however, indicate that land in the Study Area will be developed within the next 20 years. If a freeway were not constructed, it is expected that floodplains would need to be crossed in several locations at major arterial streets to enable transportation into and out of the Study Area. Some streets now cross the Salt River at grade and have been periodically closed because of minor channel flooding.

MITIGATION

Mitigation of the 100-year floodplain encroachments of the Western Section action alternatives would be accomplished by constructing bridge and culvert structures, where appropriate, to accommodate 100-year floodwaters. Design changes would be evaluated during the project design phase to further mitigate the impact.

The proposed action would affect floodplains. The Salt River and UPRR floodplains extend across the entire width of the Western Section of the Study Area. The location of the encroachments correlates to the established western logical terminus at I-10 (Papago Freeway) for all of the action alternatives and options.

Mitigation measures would minimize the potential for property loss or hazard to life. Developments to the south and west of the freeway in the Western Section would have a higher level of flood protection than now exists. The following describes measures to minimize impacts on floodplains as a result of the proposed action.

None of the action alternatives would completely avoid causing impacts because any freeway in the southwestern Phoenix metropolitan area and located near the Salt and Gila rivers would necessarily encroach onto floodplains.

ADOT Design Responsibilities

The Maricopa County Floodplain Regulations define a *floodway* as "the channel of a river or other watercourse and the adjacent land areas necessary in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot." The floodway is the stream channel and the portion of the adjacent floodplain that must remain open to permit passage of a base flood. Bridge structures for all of the action alternatives would be designed to cross floodplains in such a way that their support piers and abutments would not contribute to a rise in floodwater elevation of more than a foot. Floodplain impacts would be minimized by implementing transverse crossings of the floodplains and avoiding longitudinal encroachments. Any of the action alternatives would require comprehensive analyses of hydrology, hydraulics, sediment transport, and erosion to minimize the impacts of encroachment. ADOT would conduct these analyses during the design phase. As indicated in Section 505(a) of the Floodplain Regulations for Maricopa County:

> In accordance with A.R.S. § 48-3613, written authorization shall not be required, nor shall the Board prohibit the following except that before any construction authorized by this subsection may begin, the person shall submit plans for the construction to the Floodplain Administrator for review and comment: a. Construction of bridges, culverts, dikes and other structures necessary to the construction of public highways, roads and streets intersecting or crossing a watercourse.

The Maricopa County Floodplain Manager would be given an opportunity to review and comment on the design plans.

On-site Drainage

Design criteria for on-site drainage would be based on ADOT's *Roadway Design Guidelines* (2012a) and

Highway Drainage Design Manual – Hydrology (1993) and on FHWA's *Urban Drainage Design Manual* (2001a).

Off-site Drainage

ADOT's *Roadway Design Guidelines* (2012a) provides criteria to be used for off-site flows affected by the proposed action:

- Culverts would be sized based on the design discharge of a 100-year storm.
- Increases in water surface elevations as a result of the new facilities would be contained within the existing and proposed R/W or as noted in accordance with Section 611.3.C.
- Culverts would be designed to be self-cleaning, Section 611.3.E.
- Reinforced concrete box culvert and reinforced concrete pipe would be provided with adequate cover.

If an action alternative were to become the Selected Alternative, it would need comprehensive hydrologic, hydraulic, sediment transport, and erosion-related assessments regarding potential 100-year flood effects associated with ephemeral washes. Results would provide information necessary to make a determination regarding what mitigation measures would need to be implemented. Measures may include physical structures associated with the freeway such as culverts. These measures would be determined during the design phase.

CONCLUSIONS

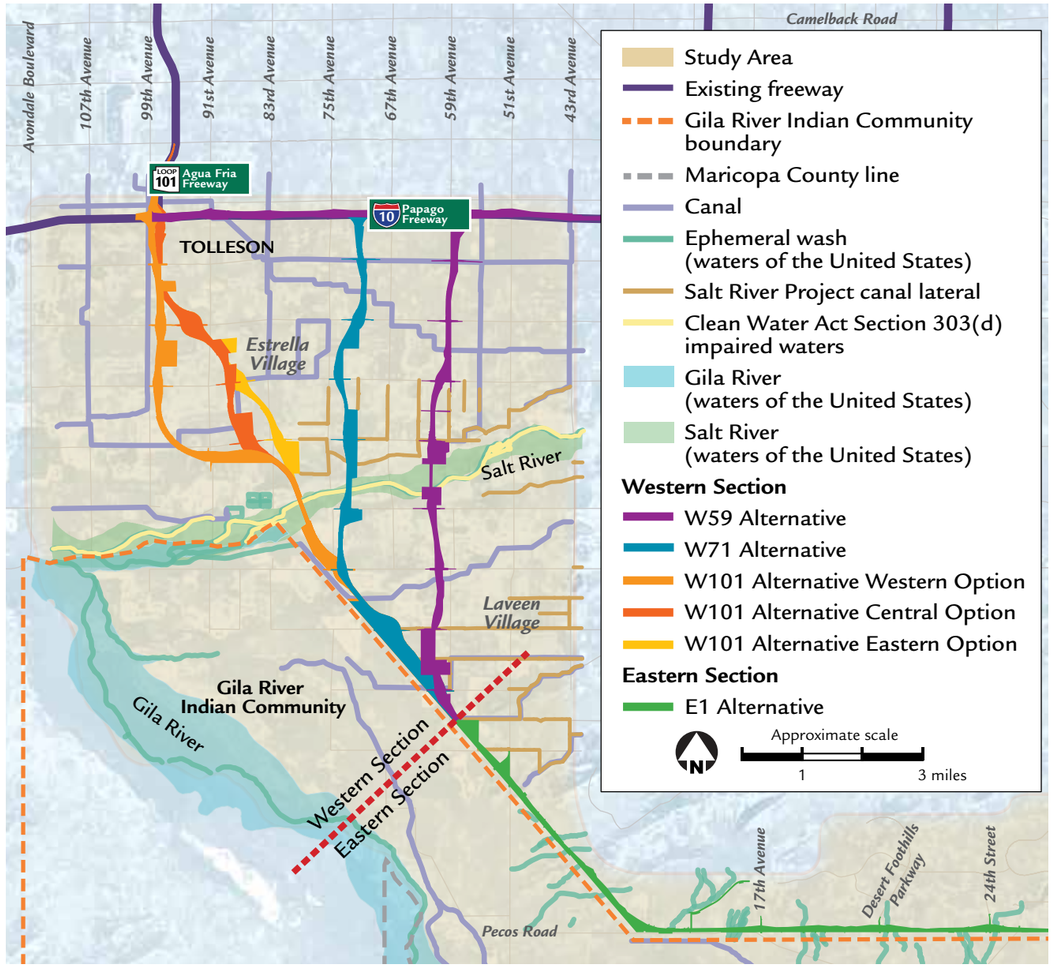
Implementation of any of the Western Section action alternatives would involve crossing the Salt River and UPRR floodplains, with the W71 Alternative having a substantially greater impact on floodplain acreage (127 acres) than would either the W59 (Preferred) Alternative (94 acres) or W101 Alternative and its Options (48–52 acres). Regardless of the action alternative identified as the Selected Alternative, if an action alternative were to be so identified, impacts on the overall natural and beneficial values of the floodplain would be negligible. The differences in floodplain impacts among action alternatives in the Western Section would be inconsequential, and impacts from floodplain encroachment would be effectively mitigated through an elevated crossing (on piers) of the floodplain, using appropriate bridge design. Under the No-Action Alternative, continuing urbanization in the foreseeable future would likely lead to further encroachment into federally mapped floodplains.

The E1 (Preferred) Alternative would not cross any federally mapped floodplains.

WATERS OF THE UNITED STATES

USACE administers Section 404 of the CWA, which regulates the discharge of dredged or fill material into waters of the United States (jurisdictional waters; see sidebar on page 4-118), including wetlands. USACE regulates jurisdictional waters through permitting, using nationwide and individual permits. Types of waters of the United States that are regulated include ephemeral washes, intermittent and perennial streams, springs, riverbeds, wetlands, and other special aquatic sites. The physical attributes of a water body are a key component of the waters of the United States determination. The types of activities that may affect jurisdictional waters are fundamental to the associated permitting requirements and development of appropriate mitigation measures.

Figure 4-36 Surface Water Features, Western Section



Note: Widths of canals, washes, and laterals are not to scale.

Potential waters of the United States are associated with ephemeral washes, some canals, and the Salt and Gila rivers.

AFFECTED ENVIRONMENT

Jurisdictional waters in the Study Area include ephemeral washes and the Salt and Gila rivers. The guidance for identifying existing conditions for jurisdictional waters was:

- USACE regulatory guidance letter (No. 08-02) for jurisdictional delineations, dated June 26, 2008 (USACE 2008a)
- discussions with USACE regarding the method of identifying waters of the United States in Arizona, including ephemeral washes and the Salt River channel
- field investigation of waters of the United States to determine jurisdictional limits (in 2003 and 2013)
- CWA jurisdictional memorandum and guidance to EPA regions and USACE districts regarding the Supreme Court decision in the consolidated cases *Rapanos v. United States* and *Carabell v. United States* (December 2, 2008)

Field delineation of ephemeral washes in the Eastern Section was initially conducted in 2003. All delineations were conducted in accordance with:

- *Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest* (USACE 2001)
- *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid Region of the Western United States* (USACE 2008b)

At that time, USACE informally concurred that the ephemeral washes identified were potentially jurisdictional. Guidance from EPA and USACE (2008) called for these determinations to be revisited with USACE.

As committed to in the DEIS, a field delineation of jurisdictional waters for the Preferred Alternative (E1 and W59) was conducted in the summer of 2013 to identify jurisdictional waters and to define the jurisdictional limits for the CWA Section 404 permitting. A preliminary jurisdictional determination was submitted to USACE in January 2014 in accordance with USACE and ADOT guidelines. USACE issued a preliminary jurisdictional determination in March 2014.

Western Section

Approximately 9 linear miles of the Salt River channel are within the Study Area. The Salt River channel is considered a water of the United States. The channel functions as a surface water conveyance system and offers some attenuation of flood flows (Arizona Floodplain Management Association 2000). The channel may trap suspended sediment and retain nutrients from discharge flows, thus serving a water quality function. The Salt River is oriented from east to west across the Western Section of the Study Area from 39th to 111th avenues. The Salt River channel is surrounded by cultivated fields and various forms of development (residential, commercial, and industrial). These areas are relatively flat, with drainage patterns having been altered by land use practices. Numerous irrigation supply, feeder, and return channels have been constructed in the upland agricultural areas. Figure 4-36 illustrates the larger scale potential waters of the United States in the Western Section of the Study Area.

Several locations in the Salt River channel have been mined for aggregate material, and, as a result, there are several abandoned or active aggregate extraction pits. The pits may intercept groundwater and may have

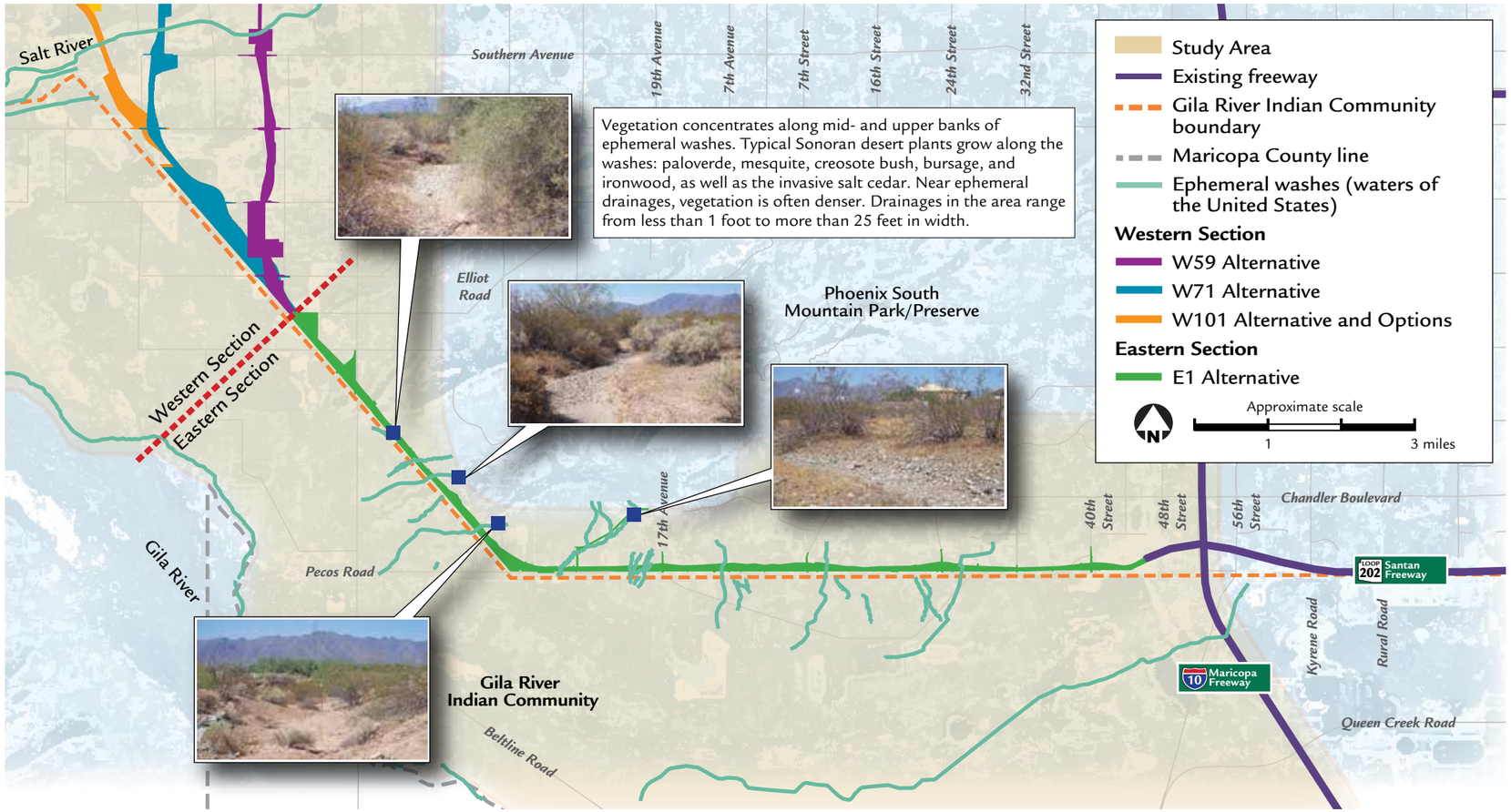
varying depths of water, depending on time of year and fluctuating annual hydrologic cycles. Consultation with the USACE Arizona office regarding these mined areas, however, resulted in a determination that the former gravel mining pits are generally not jurisdictional wetlands.[36]

Eastern Section

The Eastern Section of the Study Area contains numerous ephemeral washes that drain the southern side of the South Mountains and their associated foothills. These ephemeral washes, which are potentially jurisdictional waters, trend to the south or slightly southwest and discharge to either the Gila River (south of the E1 Alternative) or to the inactive agricultural fields along the border of Community land. Residential development along the foothills of the South Mountains has altered some drainages and washes. The delineated washes are shown in Figure 4-37.

These channels and drainages vary from less than 1 foot to more than 100 feet in width. The channel substrate also varies, but is generally bedrock, gravel/cobble, or coarse sand. Many of the channels are relatively shallow, with marginal bank definition. In addition, many of the channels have braided subchannels within the main channel. This is most evident in the channels along the southernmost portion of the South Mountains' drainage. Most of the channel bottoms are devoid of vegetation, with the upland vegetation adjacent to the drainages consisting of typical Sonoran Desert plants such as paloverde, mesquite, ironwood, creosote bush, and various species of cacti, including saguaros. Northwest of the South Mountains foothills, the channel banks of these ephemeral washes become less defined. Many of the washes near 51st Avenue and the boundary with Community land comprise shallow, multibraided subchannels. These subchannels are subject to movement and realignment during storms and along existing road alignments or other areas of disturbance.

Figure 4-37 Typical Ephemeral Washes, Eastern Section



Note: Widths of washes are not to scale.

The Eastern Section of the Study Area is heavily dissected, with washes throughout, particularly along the southern flanks of the South Mountains.

ENVIRONMENTAL CONSEQUENCES

Action Alternatives, Western Section

All action alternatives in the Western Section would cross the Salt River channel, a water of the United States. The roadway bridge associated with each action alternative would affect jurisdictional waters (the Salt River) through construction of piers in the channels. The preliminary Salt River bridge design was used to calculate the area of potential impact for each action alternative. The acreage associated with fill from the bridge piers placed in the riverbed was used to determine the type of USACE permit needed. Based on the 2013 preliminary jurisdictional delineation of the W59 (Preferred) Alternative, disturbances to jurisdictional waters caused by the W59 Alternative would be less than 0.5 acre; therefore, Nationwide Permit #14, *Linear Transportation Projects*, could be used.

What are "waters of the United States"?

33 C.F.R. § 328.3 defines "waters of the United States" as follows:

"(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(2) All interstate waters including interstate wetlands;

(3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:

(i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or

(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(iii) Which are used or could be used for industrial purpose by industries in interstate commerce;

(4) All impoundments of waters otherwise defined as waters of the United States under the definition;

(5) Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section."

Action Alternative, Eastern Section

The Eastern Section of the Study Area contains numerous washes that drain the southern side of the South Mountains and their associated foothills (Figure 4-37). Ephemeral washes potentially constitute waters of the United States in the Eastern Section of the Study Area. Field inspections were conducted in August 2003, and 51 ephemeral washes were identified. The findings from the field investigation were presented and discussed with USACE in October 2003, and USACE concurred that the ephemeral washes identified are potential waters of the United States (see the sidebar on this page).

A meeting was held with USACE in June 2013 to discuss its expectations for the preliminary jurisdictional delineation of the E1 (Preferred) Alternative. Following that meeting, a preliminary jurisdictional delineation of the E1 Alternative was conducted in the summer of 2013; it identified 49 ephemeral washes as jurisdictional waters. Figure 4-37 provides photographs of typical ephemeral washes in the Eastern Section of the Study Area.

The E1 (Preferred) Alternative would cross most of the washes identified in the Study Area. Roadway structures associated with the E1 Alternative would affect jurisdictional waters by placing fill in some of the channels. The drainage system anticipated for this section of the project would channel minor washes to major washes. Transverse crossings for major washes would be constructed using culverts to convey stormwater runoff beneath the roadway. The acreage impacts associated with roadway construction were determined using the following assumptions:

- The preliminary jurisdictional delineation limits of the E1 Alternative would not change.
- Proposed roadway R/W width varies between 300 and 1,000 feet. However, near the washes, it would be closer to 300 feet.

It is anticipated that the E1 Alternative would permanently affect between 1 and 2 total acres of jurisdictional waters (ephemeral washes), and there is the potential that greater than 0.5 acre of impacts may occur at individual wash crossings; CWA permitting would be determined during the project design phase. Temporary construction zones may result in additional impacts on jurisdictional waters. Once these zones have been identified, a determination would be made by USACE, ADOT, and FHWA regarding whether additional mitigation would be warranted. Because the impact acreage is based on conservative design limits, it is anticipated that design refinement and construction sequencing would result in a reduction of impacts on jurisdictional waters.

No-Action Alternative

The No-Action Alternative would not result in direct impacts on waters of the United States.

MITIGATION

It is anticipated that the W59 (Preferred) Alternative would qualify for Section 404 of the CWA Nationwide Permit #14, *Linear Transportation Projects*, because of the limited amount of fill that would be placed into jurisdictional waters. ADOT would comply with all terms and conditions of the CWA permitting as established by USACE.

If an Individual Permit under Section 404 of the CWA would be required for the E1 (Preferred) Alternative, the March 18, 2013, FHWA, ADOT, and USACE Memorandum of Agreement, amended from the original Memorandum of Agreement, effective June 18, 2012, would be implemented (Appendix 4-5, beginning on page A662), which applies to transportation projects that are FHWA actions under NEPA and that require USACE permits under Section 404 of the CWA (USACE 2013). The Memorandum of Agreement commits FHWA, USACE, and ADOT to establish priority review of federally funded projects with the goal of achieving timely design and implementation of highway improvements while ensuring the design and implementation are sensitive to the protection of aquatic resources under USACE's jurisdiction. USACE participated in identification of the Preferred Alternative. Under Section 404(b)(1), USACE is obligated to select the least environmentally damaging practicable alternative after considering cost, existing technology, and logistics, in light of overall project purposes (40 C.F.R. § 230).

None of the action alternatives would provide the opportunity for complete avoidance of jurisdictional waters because any freeway in the southwestern Phoenix metropolitan area connecting I-10 (Maricopa Freeway) to I-10 (Papago Freeway) would cross the Salt River and ephemeral washes. Crossing jurisdictional waters of the United States was, however, one of the screening criteria used during the alternatives analysis (see the section, *Alternatives Development and Screening*, beginning on page 3-1). The project team, which included ADOT, FHWA, and USACE, sought to avoid waters of the United States, where practicable.

According to Section 404(b)(1), when avoidance of waters of the United States would not be practicable, minimization of impacts would be achieved and unavoidable impacts would be mitigated to the extent reasonable and practicable.

The following steps have been or would be taken by ADOT as part of a Section 404 Individual Permit requirement in addressing Section 404(b)(1) guidelines:

- minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts
- rectify impacts by repairing, rehabilitating, or restoring the affected environment
- reduce impacts over time by preservation and maintenance operations during the life of the action
- compensate for impacts by replacing, enhancing, or providing substitute resources or environments

The general and special conditions of the Section 404 Individual Permit would minimize impacts on waters of the United States to the extent practicable. The proposed project would require water quality certification under Section 401 of the CWA. The following is a summary of potential minimization measures outlined to satisfy conditions of the Sections 404/401 permits.

ADOT Design and Environmental Planning Group Responsibilities

- ADOT would prepare and submit an application to USACE for a CWA Section 404 permit as appropriate, dictated by impacts on jurisdictional waters. No work would occur within jurisdictional waters until the appropriate CWA Sections 401 and 404 permits were obtained.
- If more time were to be required to complete the proposed action than authorized by the permit, ADOT would submit a request for a time extension to USACE at least 1 month prior to reaching the authorized date.
- If previously unidentified cultural resources were to be encountered in or adjacent to waters of the United States during the proposed undertaking, ADOT would notify FHWA and USACE immediately to make arrangements for the proper treatment of those resources.

ADOT Right-of-Way Group Responsibility

- If ADOT were to sell the freeway, ADOT would obtain the signature of the new owner in the applicable space provided in the permit and forward a copy of the permit to USACE to validate the transfer of the authorization.

ADOT District Responsibilities

- The CWA Section 401 water quality certification would certify only the activities and construction of the Selected Alternative and would be valid for the same period as the CWA Section 404 permits. If project construction were not started by the USACE deadline, the applicant would notify ADEQ.
- ADOT would provide a copy of the Section 401 water quality certification conditions to all appropriate contractors and subcontractors. ADOT would post a copy of these conditions in a water-resistant location at the construction site where it may be seen by workers.
- ADOT would maintain the project authorized by the permit in good condition and in conformance with the terms and conditions of the permit. ADOT would not be relieved of this condition even if ADOT were to abandon the project. Should ADOT cease to maintain the freeway or abandon the freeway without a good faith transfer, ADOT would obtain a modification of the permit from USACE.
- If a substantive change/modification to the project were necessary, ADOT would provide notice and supporting information to ADEQ and USACE for review. ADEQ and USACE would then modify the certification to include the change/modifications, provided that water quality standards for surface waters (18 A.A.C. § 11, Article 1) would be achieved.
- When construction were to begin, ADOT would notify ADEQ and USACE prior to the start date. When notification were made, ADOT would provide the start date and the name and phone number of the primary contractor and a contact person. When the activities were completed, ADOT would notify ADEQ and USACE as soon as practicable after project completion.
- Water used for dust suppression would not contain contaminants that could violate ADEQ water quality standards for surface waters or aquifers and would not be discharged off site. ADOT would obtain the necessary permits for such activities.
- ADOT would comply with all conditions set forth in the Section 401 water quality certification made as part of the project.
- ADOT would allow USACE and ADEQ representatives to inspect the project at any time as determined to be necessary to ensure that it was being accomplished in accordance with the terms and conditions of the permit.
- ADOT would prepare written instruction for all supervisory construction personnel on the protection of cultural and ecological resources, including all agreed-to environmental stipulations for the project and all conditions required by the permit. The instructions would address federal and State laws regarding antiquities, plants, and wildlife, including collection, removal, and the importance of these resources and the purpose and necessity of their protection.
- Prior to initiating construction activities under the permit, ADOT would ensure that the contractor(s) would have been provided with a copy of the Section 404 authorization. This would be intended to confirm that the contractor(s) would comply with the terms and conditions of the Section 404 authorization.

Contractor Responsibilities

- Debris (such as soil, silt, sand, rubbish, cement, asphalt, oil or petroleum products, organic materials, tires, or batteries) derived from construction or demolition activities would not be deposited at any site where it may be washed into waters of the United States. After completion of the proposed project, the washes would be left in an environmentally acceptable condition, with all temporary construction and nonnative materials removed from the watercourse.
- Pollution from the operation of equipment in the floodplain would be cleaned up and removed before it could be washed into a watercourse. Spills would be promptly cleaned and properly disposed.
- Temporary erosion and sediment control measures would be installed, at a minimum, according to ADOT's *Standard Specifications for Road and Bridge Construction* (2008) and *Erosion and Pollution Control Manual* (2012c), prior to construction and would be maintained as necessary during construction and would not be installed in a manner that causes non-compliance with the Section 404 permit.
- If permanent erosion and sediment control measures were required, they would be installed as soon as practicable, preferably prior to construction activities, and would be maintained throughout the life of the project. Permanent erosion and sediment control measures would be located to protect

downstream entities from construction impacts when there would be a flow in watercourses within the project boundary.

- Access roadways and staging areas would be designed to allow normal storm flows to pass unimpeded. There would be no significant change to the hydraulic conditions of the upstream waters as a result of the temporary constructed features.
- No petroleum products would be stored within the 25-year flood boundary of the Salt River, the Gila River, or unnamed tributary washes. Any soil contaminated as a result of contractors' operations would be disposed of in an appropriate, approved disposal facility.
- No excavation, fill, or leveling would be permitted in the watercourses outside the boundaries of the permitted work area.
- No fill would be taken from any watercourse outside the boundaries of the permitted work area. Fill would come from an area outside the OHWM of any watercourses and would be free of any contaminants or pollutants.
- Heavy equipment traffic would be restricted from entering the watercourses outside the boundaries of the permitted work area. Appropriate barricades would be installed to preclude this activity.
- During construction, the work sites would be maintained such that no construction debris or material spillover would be allowed in the watercourses. Upon completion of the work, all construction debris and excess material would be removed from the job sites and disposed of appropriately outside the USACE jurisdictional areas.
- During construction, appropriate measures would be taken to accommodate flows within the watercourses, such that waters would not be diverted outside the OHWM.
- Prior to construction, the contractor would review and sign the C*hecklist for Environmental Compliance*. ADOT would also sign the checklist and return it to ADOT EPG 7 calendar days prior to construction.
- The contractor should comply with all terms, general conditions, and special conditions of the Section 404 permit, as established by USACE and the Section 401 Water Quality Certification certified by ADEQ.
- No work would occur within jurisdictional waters until the appropriate CWA Sections 401 and 404 permits were obtained.

CONCLUSIONS

In the Western Section, the W59 (Preferred) Alternative is anticipated to affect less than 0.5 acre of jurisdictional waters (the Salt River) and would be permitted under a nationwide permit.

In the Eastern Section, the E1 (Preferred) Alternative would cross several jurisdictional waters. These washes receive runoff from the South Mountains that passes under Pecos Road through a series of culverts following natural drainages/washes. The design of the E1 Alternative would alter the drainage pattern through use of a series of drainage detention basins that would direct runoff to specific locations to discharge under the freeway and onto Community land (see the section, *Drainage*, beginning on page 3-58). The E1 Alternative is anticipated to permanently affect between 1 and 2 total acres of jurisdictional waters (ephemeral washes), including potential disturbances of greater than 0.5 acre at individual wash crossings; CWA permitting would be determined during the project design phase.

Under the No-Action Alternative, no project-related impacts on jurisdictional waters would occur; however, continuing urban development associated with projected growth in the region and Study Area would continue to exert pressure to alter jurisdictional waters.

With any action alternative, permits would be required under Sections 404/401 of the CWA. ADOT has followed Section 404 Individual Permit requirements in addressing Section 404(b)(1) guidelines (see page 3-27). USACE participated with FHWA and ADOT in the identification of the Preferred Alternative. Under Section 404(b)(1), USACE is obligated to select the least environmentally damaging practicable alternative after considering cost, existing technology, and logistics, in light of overall project purposes.

The general and special conditions of the Section 404 permits would minimize impacts on jurisdictional waters to the extent practicable. ADEQ would issue Section 401 certification for compliance with water quality prior to Section 404 permit issuance.

TOPOGRAPHY, GEOLOGY, AND SOILS

This section provides an overview of the geologic setting in the Study Area and preliminary information concerning geotechnical and geologic conditions in the Study Area. The evaluation presented in this section is based on available information on regional and local geology, mining activity, regional and local seismicity, and regional and local land subsidence and earth fissuring.

Numerous geotechnical studies have been conducted in the Study Area. Two previous studies, *Preliminary Geotechnical Investigation Report, Southwest Loop Highway – SR 218, I-10 & 59th Avenue to I-10 & Pecos Road* (Sergent, Hauskins, & Beckwith 1987a) and *Geotechnical Investigation Report, Southwest Loop Highway – SR 218, I-10 & 59th Avenue to I-10 & Pecos Road* (Sergent, Hauskins, & Beckwith 1987b), were performed for ADOT. Reynolds (1985) performed a detailed study of geology at the South Mountains, and Demsey (1989), Reynolds and Skotnicki (1993), and Waters and Ravesloot (2000) published studies regarding the Quaternary geology in the Study Area. Studies regarding soils in the Study Area were performed by Adams (1974), Hartman (1977), and Johnson et al. (1986). Groundwater and well data are available from the Arizona Well Registry Distribution Database (ADWR 2002) and from the Groundwater Sites Inventory (ADWR 2008). Regional land subsidence and earth fissuring maps were created by Laney et al. (1978), Schumann (1974, 1992), Shipman (2007), and the ADWR Hydrology Division (ADWR 2008). The regional seismicity was detailed by Euge et al. (1992) and USGS (2006).

AFFECTED ENVIRONMENT

Overview of Geologic Conditions

The Study Area lies within the desert region of the Basin and Range Physiographic Province. The dominant physiographic feature in the Study Area is the South Mountains, which are isolated, northeast-trending ridges surrounded by a broad expanse of alluvial deposits. The northern side of the South Mountains is drained by the Salt River, and the southern and southwestern sides of the South Mountains are drained by the Gila River.

Study Area topography is dominated by the presence of the Salt and Gila rivers and the South Mountains. The elevation generally ranges from 2,400 feet above mean sea level at the crest of the South Mountains to 950 feet above mean sea level at the confluence of the Salt and Gila rivers, which is at the western edge of the Study Area, in the Western Section. In the Western Section of the Study Area, the topography north of the Salt River is relatively flat, gently sloping to the southwest. The topography south of the Salt River also is relatively flat, gently sloping either to the northwest toward the Salt River or to the southwest toward the Gila River. The topography in the Eastern Section of the Study Area is variable in elevation, traversing the low foothills of the South Mountains.

The dominant geologic features are the bedrock of the southern flanks and foothills of the South Mountains, adjacent alluvial fans and piedmonts, and the basin sediments of the Salt and Gila rivers, including their associated floodplains and terraces. The bedrock geology of the southern flanks of the South Mountains and their associated foothills in the Study Area consists of granitic and related rock and metamorphic gneissic rock. The alluvial fan deposits and piedmonts of the South Mountains are predominantly granular deposits that can include abundant cobble- and boulder-sized material. These deposits vary in thickness and often exist as only a thin veneer of colluvium or alluvium overlying bedrock. The geology of the Salt and Gila rivers and of their associated floodplains and terrace deposits generally consists of highly stratified, predominantly fine-grained, alluvial deposits and active channel deposits consisting of varying mixtures of clay, silt, sand, gravel, and cobbles. Typically, the Gila River channel deposits contain less gravel and cobbles and more sand than do the Salt River deposits.

Groundwater

The Study Area lies within the West Salt River Valley Subbasin of the Phoenix AMA. Groundwater distribution in the Study Area is highly variable. In the alluvial environments dominated by the Salt and Gila rivers, groundwater is abundant and may be found near the surface. In the bedrock, piedmont, and alluvial fan environments associated with the South Mountains, little-to-no groundwater is likely to be found. Groundwater use differs substantially in the Study Area. South of Estrella Drive, generally in the Eastern Section of the Study Area, there is relatively little groundwater use. North of Estrella Drive, generally in the Western Section of the Study Area, groundwater is used extensively for agricultural and municipal purposes. In Ahwatukee Foothills Village, in the Eastern Section of the Study Area, groundwater is used to fill private lakes for golf courses and residential neighborhoods.

Depth to groundwater varies throughout the Study Area. Along the Eastern Section of the Study Area, depth to groundwater is greater than 50 feet. USGS groundwater level data were obtained in the Ahwatukee Foothills Village area for several different wells, and the depth to groundwater ranged between 97 and 117 feet below ground surface (USGS 2006). Areas south of Lower Buckeye Road may have depths to groundwater of less than 50 feet (ADWR 2002). Also in the Eastern Section, ADWR Groundwater Site Inventory data from 2007 to 2008 indicate depths to groundwater of about 65 to 75 feet below ground surface in the Laveen Village area just west of the western flanks of the South Mountains (based on data from two wells), and about 120 feet below ground surface in the Ahwatukee Foothills Village area near Chandler Boulevard and I-10 (based on data from one well). USGS data for multiple wells in the Western Section of the Study Area (including Laveen Village and the Salt River areas) indicate that depths to groundwater range from 9 to 134 feet below ground surface. Also in the Western Section, ADWR Groundwater Site Inventory data from 2007 to 2008 indicate depths to groundwater of about 40 to 120 feet below ground surface north of the Salt River (based on data from seven wells), and about 30 to 40 feet below ground surface south of the Salt River (based on data from four wells). Shallow, perched groundwater could be present in the southern portion of the Eastern Section and the northern portion of the Western Section in areas under irrigation

or previously under cultivation. In most instances, this groundwater would be the result of seepage from tailwater ditches or unlined irrigation laterals. In both the Eastern and Western Sections, progressing toward the South Mountains and their foothills, the unconsolidated deposits thin and groundwater may be isolated in perched zones.

Land Subsidence and Earth Fissuring

Land subsidence attributable to groundwater withdrawal in alluvial basins in the Basin and Range Physiographic Province is a process of compression and subsequent consolidation of the alluvial sediments. Through geologic time, groundwater levels in the alluvial basin materials were at or near the ground surface or at elevations controlled by the rivers and drainage systems traversing the basins. Human activities have affected and are continuing to affect groundwater levels in many of these basins. Groundwater pumping, primarily for agricultural, industrial, and municipal uses, has depleted stored groundwater in many areas. In addition, damming of rivers in mountainous portions of the surrounding watersheds has reduced the available recharge potential.

Based on regional mapping (Laney et al. 1978; Schumann 1974, 1992) and available National Geodetic Survey data, land subsidence in the Study Area has been limited to less than 1 foot. Historic groundwater declines have been between 50 and 100 feet in areas located away from the South Mountains and their associated foothills (Laney et al. 1978; Laney and Hahn 1986; ADWR 2002). Declines of this magnitude have resulted in only minor land subsidence. In the early 1990s, scientists began to use Synthetic Aperture Radar and interferometric processing (Interferometric Synthetic Aperture Radar) to detect land surface elevation changes. Interferometric processing has developed into a highly reliable land subsidence monitoring tool used by ADWR since 2002 to identify and map subsidence features in Arizona. The most current ADWR subsidence maps were reviewed at the ADWR Web site (ADWR 2009). Based on the ADWR mapping, no land subsidence zones exist within or adjacent to the Study Area.

Earth fissuring poses an erosional hazard because normal surface drainage captured by fissures can result in the formation of substantial fissure gullies. Earth fissures in areas of large groundwater decline in alluvial aquifers are likely associated with a process termed "generalized differential compaction." Because of this process, fissures commonly develop along the perimeter of subsiding basins, often in apparent association with buried or protruding bedrock highs, suspected mountain-front faults, or distinct facies changes in the alluvial section. The Arizona Geological Survey conducts comprehensive mapping of earth fissures and delivers earth fissure map data to ASLD. Earth fissure planning maps covering Maricopa County (Shipman 2007) were reviewed to identify known or reported earth fissures within or near the Study Area. Based on these maps, no earth fissures are known to exist within or adjacent to the Study Area.

Regional and Local Seismicity

Minimal historical seismic activity has been recorded in Maricopa County and the Study Area. No recognized active faults are located within the proposed alignments of any of the action alternatives (USGS 2006). Euge et al. (1992) prepared a report for ADOT that included evaluation of seismic criteria for the state of Arizona. This report presents maps of expected horizontal acceleration in bedrock, with a 10 percent probability of exceedance in both 50 and 250 years. For the Study Area region, the approximate values of acceleration are 0.03 of unit gravity (g) for an exposure time of 50 years and 0.07g for 250 years.

While the Euge et al. (1992) report included a regional evaluation of seismic criteria, USGS data were used to evaluate a specific site within the Study Area. Probabilistic earthquake ground motion values were obtained from the USGS National Seismic Hazard Mapping Project, Earthquake Hazards Program (USGS 2002) for the intersection of 51st Avenue and Pecos Road (specifically, for 36.28 degrees North latitude, –112.16 degrees West longitude). Interpolated, probabilistic ground motion values of peak ground acceleration in rock for 2 and 10 percent probabilities of exceedance in 50 years were obtained for this site in the Study Area:

- 10 percent probability of exceedance in 50 years, with a return period of 475 years: 0.037g
- 2 percent probability of exceedance in 50 years, with a return period of 2,475 years: 0.072g

These peak ground acceleration values are for firm rock (rock with shear-wave velocity of 2,500 to 5,000 feet per second in the upper 100 feet of profile), categorized as Site Class B in accordance with the International Building Code, Chapter 16, Section 1613.2, Table 1613.5.2 (International Code Council, Inc. 2006). These values would need to be evaluated and adjusted as appropriate based on the subsurface profile encountered during final geotechnical investigations. Seismic ground motion values for design of the roadway, bridges, and other structures would need to be adjusted using appropriate attenuation factors for actual in-place materials as presented in Chapter 16 of the International Building Code (2006).

Mineral Resources

Mineral resources in the Study Area include sand and gravel and precious metals. Sand and gravel are the most important mineral resources in the Study Area. These resources are primarily found adjacent to or within the Salt and Gila rivers. The South Mountains and their associated foothills contain potential precious metal resources. Historical mining of precious metals has been limited in scope, however, and it is unlikely that mining in the Study Area would occur in the foreseeable future.

A search of the Arizona Mineral Industry Location System database (Arizona Department of Mines and Mineral Resources 2001), examination of aerial photographs, and field investigations indicated that seven sand and/or gravel operations or companies are within the R/W of the various Western Section action alternatives.

One gold mining claim and six unknown mining claims are included in the database but are not located within the proposed alignments of the action alternatives. From topographic maps, several mining features are located south of the South Mountains, but none of these are located within the proposed alignment of the E1 Alternative.

ENVIRONMENTAL CONSEQUENCES

This section outlines the construction impacts on geologic and geotechnical conditions in the Study Area. No impacts on geologic and geotechnical conditions would occur as a result of operation of the proposed action.

Action Alternatives, Western and Eastern Sections

Within the context of this preliminary analysis, substantive variations in the geotechnical conditions do not appear to exist among the action alternatives. Alternative and design option divergences would occur in terrain underlain by the alluvial, unconsolidated sediments of the Salt River near its confluence with the Gila River, which is located at the western edge of the Western Section. All of the Western Section action alternatives would cross the Salt River, with no notable distinction between the various locations when considering the anticipated ground conditions that would be encountered. In addition, the alluvial deposits both north and south of the Salt River channel would be similar throughout the Study Area to a degree that no distinction should be made based on this preliminary analysis.

In the Western Section of the Study Area, shallow groundwater exists throughout the area where the action alternatives and design options would diverge across the floodplain and terraces of the Salt River. Coarse-grained alluvial deposits, some cemented soils, and the potential for encountering both expansive and compressible/collapsible soils in the shallow profile would provide constraints in the Western Section. These groundwater and soil conditions may influence both the design and method of construction of roadway sections and/or bridge foundations; such conditions are commonly encountered, however, and construction technologies to overcome these conditions are readily available.

The W59 (Preferred) Alternative would adversely affect three different sand and gravel companies, at least one of which appears to be an active operation. The W71 Alternative would adversely affect two different sand and gravel companies; the operations of each appear to be inactive. The W101 Alternatives and Options would adversely affect two sand and gravel companies; the operations of only one appear to be active.

In the Eastern Section, geotechnical constraints would likely include excavation of competent bedrock and evaluation of stability of slopes completed in the bedrock. The E1 (Preferred) Alternative would traverse the foothills along the southern flank and western tip of the South Mountains, where competent bedrock generally consisting of granite and gneiss is either exposed or likely underlies a thin surface veneer of colluvial and alluvial deposits. During construction of the proposed freeway, these bedrock units would likely be encountered, resulting in difficult excavation conditions in cut sections and possibly requiring blasting to facilitate removal. The rock material resulting from the excavation of bedrock would be highly variable in particle size, with the likely production of some materials not directly suitable for use as roadway embankment fill because of the preponderance of oversized particles. If produced, these materials would need to be rejected or subjected to additional processing.

Construction through several rock slopes would likely occur along portions of the Eastern Section of the Study Area and along the aforementioned mountain flank. Design of stable slope angles and configurations would need detailed geomechanical characterization to define the orientation and condition of the rock discontinuities. These slopes would probably not be influenced by groundwater seepage nor by freeze-thaw mechanisms, thus providing a relatively stable environment for safe slopes over the long term. The major design issue would be evaluation and mitigation of the potential for detachment of portions of the constructed slope face along natural fractures in the rock mass.

In addition to the likelihood of production of some oversized particles during the excavation of rock, both the channel deposits of the Salt River and the upland portions of the alluvial fan and piedmont deposits likely contain a relatively coarse fraction. Selection or treatment may be required to use these materials as structural fill. These upland, unconsolidated alluvial units may also be cemented to a degree such that excavation would be moderately difficult.

Although their lateral distribution is not defined in the available data reviewed for this report, the geologic setting related to the valley floor and the mountain flank is conducive to the deposition of soils that may

Mitigation for Vibration-related Impacts

Near the South Mountains, bedrock may be encountered during project construction. Cuts through ridgelines of the South Mountains would be anticipated. As a result, blasting may be needed to fragment the bedrock material for removal.

Members of the public expressed concerns about potential damage to structures caused by blasting. According to one individual, blasting for construction of homes near the Study Area caused damage to other homes.

Three main adverse effects occur from blasting: flyrock, airblast, and ground motion. Flyrock is rock that is propelled through the air from a blast. Flyrock is controlled by blasting methods that reduce the likelihood of flyrock's occurrence. Access is controlled at blast sites to reduce the potential for bodily injury. Airblast is the airborne shock wave that results from the blast. In some cases, the airblast is audible, but normally the predominant frequencies are below the range of human hearing; therefore, airblast is usually felt rather than heard. The primary cause of blast damage is ground motion. Ground motion also may be caused by heavy equipment operation such as ripping. Ground motion is measured in terms of peak particle velocity, usually expressed in inches per second. As vibrations from a blast arrive at a particular location, a particle of soil or rock will vibrate randomly in all directions (longitudinal, transverse, and vertical) for a short period of time. Peak particle velocity refers to the highest velocity that the particle achieves in any of the three directions following an event.

According to the ADOT *Standard Specifications for Road and Bridge Construction* (2008), Section 107.10, the contractor is responsible for all damage resulting from the use of explosives. Special provisions for a recent project (Grand Avenue Underpass Project, constructed in 2004) required that the contractor perform preblast surveys of two existing structures. Preblast surveys are required routinely for mining operations. According to 30 C.F.R. § 816.62, preblast surveys within ½ mile of blasting are required for mining operations if requested.

Preblast surveys assess the condition of the dwellings or structures and document any existing defects and other physical factors that could reasonably be affected by blasting. Minor defects in structures, such as cracks in plaster, masonry, and other structural materials, normally result from the relative movement of the different materials of construction with changes in temperature and humidity. Preblast surveys document existing damage by photographing and recording the location, length, and width of any cracks or other visible defects in the building's foundation, interior, or exterior.

Postblast surveys may be performed following a blasting episode, but normally occur only if a blast-related damage claim is made by the homeowner to the contractor. If damages were documented in the postblast survey, according to ADOT's *Standard Specifications for Road and Bridge Construction* (2008), the contractor would be responsible for the damages.

According to the ADOT *Standard Specifications for Road and Bridge Construction* (2008), responsibility for all damage resulting from the use of explosives is assigned to the contractor that uses the explosives. In the special provisions of the construction contract for the proposed action, ADOT would include a requirement for the contractor to perform in-depth pre- and postconstruction surveys for all structures located within ½ mile in the event any blasting and/or heavy ripping were to be planned for construction purposes. This documentation should include photographic and video documentation.

possess potential for either expansion or compression/collapse. Moisture-sensitive, low-density alluvial deposits susceptible to compression or collapse often occur along the fringes of alluvial fans. Expansive soils may occur in the overbank deposits of the master streams, low in the valley floor. Geotechnical conditions would be further defined during the design phase. However, based on available data, no geotechnical constraints are anticipated.

Some soils in irrigated portions of the Study Area near tailwater ditches and canals may have a high moisture content. If present, these soils would require drying before use as roadway embankment fill or to provide sufficient bearing capacity under roadways or other structures. Because of more recent rises in the groundwater table elevation in portions of the Study Area and a slowing of the rate of decline in other parts of the Study Area, future land subsidence would be expected to have only minimal, if any, effects on the design or performance of project elements (see *Alternatives Studied in Detail*, on page 3-40, for descriptions of the action alternatives). If future groundwater withdrawal were to result in considerable groundwater-level decline, however, subsidence of sufficient magnitude to affect performance of project elements would be possible. If land subsidence were to occur within or adjacent to the Study Area, earth fissures could develop along the foothills of the South Mountains.

No-Action Alternative

Under the No-Action Alternative, only ongoing development and construction activities would affect the geologic and geotechnical conditions in the Study Area.

MITIGATION

Appropriate design of the facilities would mitigate geotechnical-related construction effects. Appropriate design would include excavations and slopes in soil and rock with an accepted degree of safety, placement of fills with an accepted degree of safety, protection of excavation and fill slopes against erosion, and design of roadway subgrade and foundations in accordance with accepted practices (see text box on previous page for additional mitigation).

Implementation of the Western Section action alternatives would mean acquisition of sand and gravel operations within the Salt River riverbed. These properties would be included in the project's acquisition and relocation assistance program. The program is conducted in accordance with the Uniform Act of 1970 (49 C.F.R. § 24), which identifies the process, procedures, and time frame for R/W acquisition and relocation of affected businesses. Relocation resources would be available to all business relocatees, without discrimination. All acquisitions and relocations resulting from the proposed freeway would comply with Title VI and with 49 C.F.R. § 24. Private property owners would be compensated at fair market value for land and may be eligible for additional benefits. In the final determination of potential relocation impacts during the acquisition process, ADOT would provide, where possible, alternative access to properties losing access to the local road network. In the event that alternative access could not be provided, ADOT would compensate affected property owners in accordance with 49 C.F.R. § 24.

Prior to issuance of the ROD, ADOT would consider protective and hardship acquisition on a case-by-case basis in accordance with criteria outlined in the ADOT *Right-of-Way Procedures Manual* (2011a). After the ROD, ADOT would consider protective and hardship acquisition of properties in those freeway sections not planned for immediate construction. Protective acquisition would aid in reducing the number of required acquisitions closer to the time of construction.

CONCLUSIONS

Geologic conditions within the Study Area would influence how the proposed action would be designed and ultimately constructed. Although preliminary investigations did not reveal any unique conditions that would substantially constrain the majority of construction activities, two geologic conditions were identified that would control design aspects and construction techniques for the proposed action. In the Western Section, shallow groundwater may influence the design of elements of the proposed freeway. In the Eastern Section, construction through mountain ridgelines would entail rock excavation in some form and need additional coordination with surrounding residents. Under the No-Action Alternative, continuing urban development would alter the landscape of the area.

No substantial differences were identified when comparing impacts among the Western Section action alternatives. Appropriate design—as commonly applied to projects of the size and features of the proposed action and to the mitigation measures outlined in this section—would mitigate any geotechnical-related construction effects.

BIOLOGICAL RESOURCES

AFFECTED ENVIRONMENT

The Study Area falls completely within the Sonoran Desert and the Basin and Range Province, between an elevation of 950 feet—at the confluence of the Salt and Gila rivers—and 2,400 feet above mean sea level at the crest of the South Mountains (Chronic 1998). The topography of the Study Area includes broad, flat, low-lying desert valleys between isolated mountains of relatively low relief (the South Mountains and the Sierra Estrella). The 16,600-acre SMPP is located within a mountain range that is part of the Phoenix Mountain Preserve system.

Some portions of the Study Area have been disturbed by development, mining (sand and gravel), and agriculture. The western end of SMPP still supports undisturbed, natural desert spaces. The area between the South Mountains and the Sierra Estrella, to the southwest, has been altered by agriculture, small commercial properties, roads, and housing. Adjacent residential development, roads, and agriculture have truncated many drainages in the area, affecting the extent of the xeroriparian vegetation.

Vegetation and Wildlife Resources

Plants are specific to the types of soil found in the area. The Study Area is located in several geologic provinces consisting of mostly sand and gravel in stream channels, with sand, silt, and clay on floodplains and playas. At the base of the South Mountains, metamorphic rocks are exposed, showing sedimentary and volcanic rocks metamorphosed to schist and gneiss (Chronic 1998; Kamilli and Richard 1998). The soils in the Study Area support a broad range of plants, from desert to wetland and riparian species.

Vegetation in the Study Area is classified as being in the biotic communities of Arizona Upland Sonoran Desertscrub and Lower Colorado River Sonoran Desertscrub (Turner and Brown 1994). Numerous tree, shrub, flower, and grass species can be found in these two biotic communities. Examples include blue paloverde (*Parkinsonia florida*), foothill paloverde (*Parkinsonia microphylla*), catclaw acacia (*Acacia greggii*), mesquite (*Prosopis* spp.), Fremont cottonwood (*Populus fremontii*), smoketree (*Psorothamnus spinosus*), ironwood (*Olneya tesota*), creosote bush (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), fourwing saltbush (*Atriplex canescens*), littleleaf saltbush (*Atriplex polycarpa*), desert broom (*Baccharis sarothroides*), ocotillo (*Fouquieria splendens*), and brittlebush (*Encelia farinosa*). Cacti can include saguaro (*Carnegiea gigantea*), buckhorn cholla (*Opuntia acanthocarpa*), hedgehog cactus (*Echinocereus engelmannii*), barrel cactus (*Ferocactus wislizenii*), prickly pear (*Opuntia* spp.), and Christmas cactus (*Opuntia leptocaulis*) (Epple 1995; Turner and Brown 1994). Small numbers of these species are found in the Study Area because much of the native habitat has been altered by agricultural, commercial, and urban development. Displacement of these species is expected to continue because of rapid development in portions of the Study Area.

Plant Communities

During an initial July 2003 field visit, different plant communities and plant species were recorded by a qualified biologist.

Distinct vegetation communities, as mapped for the Arizona GAP Analysis Program (Graham 1995), were used to characterize the Study Area and include:

- Sonoran creosotebush scrub
- Sonoran creosotebush-bursage scrub
- Sonoran paloverde mixed cacti/Sonoran creosotebush-bursage
- mixed/agriculture
- riparian/flood damaged in 1993
- Sonoran riparian/leguminous short tree forest/scrub
- Sonoran riparian/mixed riparian scrub
- Sonoran creosotebush-mesquite scrub

Plant communities that are represented within the action alternative alignments are described below (Figure 4-38). The last three categories listed above occur in the Study Area but not within the footprint of the action alternatives and are, therefore, not described in detail.

Sonoran Creosotebush Scrub

Creosote bush is a dominant or codominant species in many Sonoran communities and flourishes on gravelly plains and sandy flats. Found throughout the Study Area, the plant community typically includes foothill paloverde, ironwood, and prickly pear, among others. Action alternatives in the Western Section, between 59th and 83rd avenues and north of Baseline Road, cross remnants of the Sonoran creosotebush scrub community.

Sonoran Creosotebush-Bursage Scrub

Remnants of the plant community exist in the Western Section along the Salt River (just north of Baseline Road) and near the intersection of Ray Road and 51st Avenue in the Eastern Section. Triangle-leaf bursage thrives on rocky or gravelly flats as well as hills. Bursage is one of the most abundant shrubs in the Sonoran Desert. Together, creosote bush and bursage dominate this community. Associated members of the creosotebush-bursage scrub community are acacia, fourwing saltbush, and ocotillo.

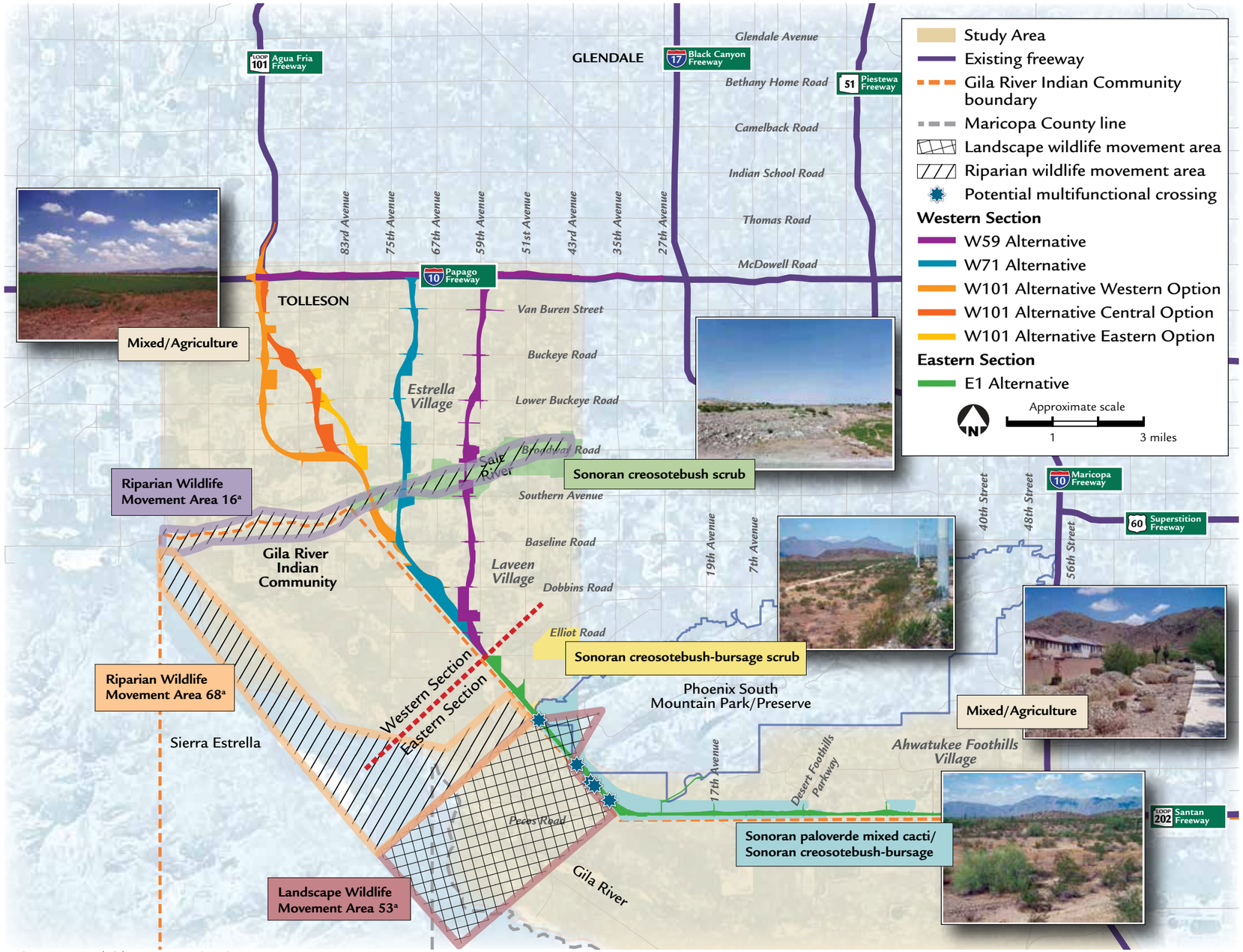
Sonoran Paloverde Mixed Cacti/Sonoran Creosotebush-Bursage

The community is distinguished by the presence of paloverde and various cacti and shrubs, including triangle-leaf bursage and creosote bush. Within the Study Area, saguaro is the most visible cactus. This plant community is found west of 32nd Street where the terrain becomes hilly approaching SMPP. Littleleaf saltbush, ironwood, and mesquite are also found within this community.

Mixed/Agriculture

The mixed/agriculture plant community covers the largest portion of the Study Area and occurs adjacent to all of the action alternatives. This community is defined by the mix of native and nonnative vegetation associated with development land uses, including residential, commercial, and industrial interspersed with agricultural fields. Much of the Western Section is predominantly in this plant community, roughly from Ray Road north to the Study Area boundary. Residential land uses occur north of Pecos Road from SMPP to the eastern Study

Figure 4-38 Plant Communities and Movement Areas Adjacent to Action Alternative Alignments



[a] Arizona Game and Fish Department (2012)

The photos typify the Study Area's major plant communities. The mixed/agriculture community is found throughout much of the Study Area (identification of specific locations is not applicable). Other distinct plant communities are found locally. Bridge crossings are proposed in areas of potential wildlife movement (see page 4-137).

Area boundary. Agricultural crops include corn, cotton, and alfalfa.

Riparian

The riparian/flood damaged community is located west of the W101 Alternative, from approximately 91st Avenue to the western border of the Study Area, and has been influenced by effluent water flows received from the 91st Avenue WWTP. As a result, the riparian community in this section of the Salt River channel and floodplain has become reestablished as well as wetlands; however, these conditions do not occur in or adjacent to the action alternatives upriver. The Salt River between 83rd and 59th avenues, where the action alternatives are located, is highly disturbed as a result of mining activities. The river flows are blocked upstream—preventing regular flows of water to this section of the river. Some mine pits and low depressions that remain undisturbed and maintain water for extended periods of time feature small, isolated riparian communities—although riparian communities are generally absent in this part of the Salt River. The riparian vegetation in this disturbed section of the river is a mix of native and nonnative species dominated by salt cedar (*Tamarix pentandra*). Other species include Fremont cottonwood, paloverde (*Parkinsonia* sp.), willow (*Salix* sp.), Russian thistle (S*alsola tragus*), desert broom, carelessweed (*Amaranthus palmeri*), sea-purslane (*Sesuvium verrucosum*), tree tobacco (*Nicotiana glauca*), and sweetscent (*Pluchea odorata*), among others. Within the Study Area, a large portion of the habitat surrounding the Salt River has been developed for agricultural, industrial, commercial, and residential use.

Downstream and adjacent to the W101 Alternative, regular tailwater/nuisance flows from the Laveen Conveyance Channel empty into the Salt River channel and support a riparian plant community, wetlands adjacent to the riparian community, and wetlands supported by the 91st Avenue WWTP. Wetlands, known as the Pee Posh Wetlands, have developed on Community land as a result of the tailwater/nuisance flows from the Laveen Conveyance Channel.

Field visits in 2009 and 2013 revealed that these plant communities were still present, although their extents varied somewhat because of natural processes and

development. The riparian community has recovered from the 1993 flood damage as discussed below.

Applicable Plant Community-Related Regulations

Two plant community-related regulations would have direct application to the proposed action. Applicability of the regulations is summarized below.

Arizona Native Plant Act

Many of Arizona's native plants are protected under the Arizona Native Plant Act (A.R.S. §§ 3-901 et seq.). Because these plants are often unusual or rare, have high value for landscaping, or are long-lived and not easily replaced, they are susceptible to theft and vandalism or are unnecessarily lost because of development (Arizona Department of Agriculture [ADA] 2009; Maricopa County 2004b). Plants that would be affected by the proposed action alternatives and options include many species protected by this law. Protected plants in the Study Area that are commonly recognized include, but are not limited to, paloverde, mesquite, ironwood, ocotillo, saguaro and other cactus species, and various yucca species. Protected plant species in the Study Area are primarily in the undeveloped, nonagricultural areas adjacent to or in SMPP; mesquite trees, however, can be found along canals and roads throughout the Study Area.

To comply with the Arizona Native Plant Act, ADOT would notify ADA at least 60 calendar days prior to construction so that ADA could determine the disposition of those plants.

Executive Order 13112, Invasive Species

Formal surveys for invasive species were not conducted throughout the Study Area; however, a survey of the Selected Alternative's project limits would be conducted prior to construction to determine the need for control of invasive species. Based on Executive Order 13112, dated February 3, 1999, all projects will,

> subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: i) prevent the introduction of invasive species; ii) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner; iii) monitor invasive species populations accurately and reliably; and iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

If an action alternative were to be identified as the Selected Alternative, invasive species in the project footprint would be treated according to an invasive species management plan and any necessary treatments would continue following completion of construction. For example, all earthmoving and hauling equipment would be washed at the contractor's storage facility prior to entering the construction site. To prevent invasive species from leaving the site, the contractor would inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to leaving the construction site. Finally, all disturbed soils that would not be landscaped or otherwise permanently stabilized by construction would be seeded using species native to the project vicinity.

Aquatic/Wetland Communities

No wetlands, as regulated under Section 404 of the CWA, are found within the action alternative alignments. However, regulated wetlands created by the Tres Rios Environmental Restoration Project in the Salt River channel downstream of the 91st Avenue WWTP and the Pee Posh Wetlands (also in the Salt River channel on Community land) are located downstream and west of the westernmost action alternative. These regulated wetlands provide important foraging and nesting sites for water birds and other wildlife species needing wetland habitat conditions.

Gravel mining pits and low depressions located along the Salt River hold water for extended periods of time. Often these pits can develop into wetlands and in some cases become regulated under Section 404 of the CWA. A field investigation conducted in October 2009 found that these mining pits and depressions were absent of wetland vegetation (plants that are adapted to live in saturated soils). Many of the mine pits have developed small, isolated riparian communities as a result of a narrow zone of riparian vegetation (plants adjacent to water sources that are often of different species composition and that grow more vigorously compared with surrounding vegetation because of greater water availability). This riparian vegetation attracts various species of birds that may use the human-made habitat for cover, foraging, and nesting. The steep sides of the pits, however, create less diverse riparian habitat compared with what is found in more gently sloping natural riverine ecosystems. The riparian vegetation in this disturbed section of the river is a mix of native and nonnative species dominated by salt cedar. Finally, concrete-lined irrigation canals are scattered throughout the Study Area, but offer little direct value to wildlife or plants given the short length of time water is in the channel, high water velocities, and steep sides. Through continued field observations since initial fieldwork in 2003, no additional wetlands have been identified.

Culturally Sensitive Species

In a letter dated July 18, 2014, the Community provided comments on the Biological Evaluation for the proposed freeway and expressed that the Community holds all animals in the highest regard and recognizes animals as culturally important. The letter included a list of plant and animal species that are culturally important to the Community. The Biological Evaluation for the proposed freeway was revised to incorporate an evaluation of the provided species (see sidebar on page 4-2 for information on how to review the report).

Wildlife Resources

General Wildlife

Wildlife abundance and diversity are directly related to the amount and variety of habitat types located in the area. Many species of wildlife are found in SMPP. Reptiles include Sonoran desert tortoises (*Gopherus morafkai*), snakes, Gila monsters (*Heloderma suspectum*), horned lizards (*Phrynosoma* sp.), and chuckwallas (*Sauromalus obesus*).[37] An amphibian, the Sonoran Desert toad (*Bufo alvarius*), was reported by the Arizona Game and Fish Department (AGFD) as having been documented in the area (see AGFD comment letter on page B64 in Appendix 7, Volume III). The mammalian population includes the black-tailed jackrabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus audubonii*), ground squirrel (*Spermophilus* sp.), ringtail cat (*Bassariscus astutus*), coyote (*Canis latrans*), kit fox (*Vulpes*

macrotis), gray fox (*Urocyon cinereoargenteus*), javelina (*Dicotyles tajacu*), and various species of bats. A mountain lion (*Puma concolor*) was removed from an area north of SMPP in 1994. From approximately 1998 to 1999, there were credible reports of a mountain lion in SMPP. AGFD has stated that lions should be considered an animal with the potential to occur in SMPP, which could represent a portion of its home range, but not a resident animal.[38] Although wild horses and burros are present on Community land and may occur adjacent to the E1 Alternative, field observations concluded no suitable habitat for wild horses or burros is or would be available within the action alternatives.

The Salt River between 83rd and 59th avenues is generally sparsely vegetated; however, development on both sides of the river, potential water sources, and relative lack of human activity likely make the Salt River an attractive movement corridor for urban and other wildlife that ventures upriver from natural habitats farther downstream. Mammal species that can be expected to regularly occur within scrub vegetation of the Salt River include javelina, coyote, gray fox, kit fox, bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), skunks (*Mephitis* spp.), jackrabbits (*Lepus* spp.), cottontail rabbit, and various bats and rodents. Other species of wildlife would include the Gila woodpecker (*Melanerpes uropygialis*), Gambel's quail (*Callipepla gambelii*), curve-billed thrasher (*Toxostoma curvirostre*), Abert's towhee (*Pipilo aberti*), cactus wren (*Campylorhynchus brunneicapillus*), mourning (*Zenaida macroura*) and white-winged (*Zenaida asiatica*) doves, greater roadrunner (*Geococcyx californianus*), red-tailed (*Buteo jamaicensis*) and Harris's (*Parabuteo unicinctus*) hawk, burrowing owl (*Athene cunicularia hypugaea*), and various snakes and lizards.

Between 83rd and 59th avenues, mine pits and low depressions in the Salt River floodplain, when water is present, attract a greater diversity of species in addition to those mentioned, such as the double-crested cormorant (*Phalacrocorax auritus*), bald eagle (*Haliaeetus leucocephalus*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), killdeer (*Charadrius vociferus*), lesser nighthawk (*Chordeiles acutipennis*), black phoebe (*Sayornis nigricans*), Lucy's warbler (*Oreothlypis luciae*), yellow warbler (*Dendroica petechia*), gnatcatchers (*Polioptila* spp.), vireos (*Vireo* spp.), and various other wildlife species. Riparian plant communities are generally absent in this part of the Salt River; however, small zones of riparian vegetation often grow along the edges of the mine pits and depressions because of the increased availability of water, creating a more diverse habitat that can attract a wider variety of species. However, given the small size of these riparian patches, they can also be an area of concentrated predation. The riparian vegetation in this disturbed section of the river is a mix of native and nonnative species dominated by salt cedar. Other species include Fremont cottonwood, paloverde, willow, Russian thistle, desert broom, carelessweed, sea-purslane, tree tobacco, and sweetscent, among others.

The riparian vegetation and wetlands in the Salt River floodplain, downstream from the 91st Avenue WWTP, host an even greater diversity of mammal, bird, reptile, and amphibian species including species listed on the federal threatened, endangered, and proposed species list such as the yellow-billed cuckoo (*Coccyzus americanus occidentalis*) and Yuma capper rail (*Rallus longirostris yumanensis*) as well as larger mammal species such as mule deer (*Odocoileus hemionus*) and possibly desert bighorn sheep (*Ovis canadensis nelsoni*).

Xeroriparian habitats (desert washes) have high value for many species of wildlife, not only because of their vegetation density and composition, but also because of their role as movement corridors. Washes occur throughout the Study Area; many, however, have been altered by previous disturbance, chiefly past agricultural activities. In addition, many have been turned into retention basins or into constructed channels through housing developments.

Outside SMPP, fewer wildlife species were observed in the Study Area. These consisted mainly of birds and a few species of lizards. During field visits, coyote, deer, and javelina signs (i.e., tracks and scat) were detected adjacent to the SMPP boundary in the western foothills of the South Mountains, and numerous rodent holes were scattered throughout the Study Area. It is known that a large number of wildlife species can and do occur in the Study Area. This document is not intended to give an exhaustive list of all species that may occur in the Study Area but to include species that are identified as State species of concern or species of greatest conservation need and that have a greater likelihood of occurring in the area affected by the action alternatives.

Common desert birds that were observed in the Study Area included curve-billed thrasher, Gambel's quail, cactus wren, canyon wren (*Catherpes mexicanus*), black-throated sparrow (*Amphispiza bilineata*), phainopepla (*Phainopepla nitens*), blue-gray gnatcatcher (*Polioptila caerulea*), Abert's towhee, greater roadrunner, white-winged dove, mourning dove, turkey vulture (*Cathartes aura*), and different species of raptors, including owls and hawks. Bald eagles have been sighted near the Western Section action alternatives.

Inactive and active agricultural fields are found in both the Western and Eastern Sections. Inactive agricultural fields would likely support native flora and fauna adapted to dry and disturbed conditions, whereas active agricultural fields would likely provide areas of standing water that could be used by water birds for foraging and nesting. Similarly, both types of agricultural fields may provide habitat for burrowing owls, which are frequently found nesting and hunting on the perimeter of agricultural fields and irrigation dikes. In flooded fields along Baseline Road, black-necked stilt (*Himantopus mexicanus*), cattle egret (*Bubulcus ibis*), and killdeer were documented. Along irrigation canals, white-winged dove, mourning dove, Inca dove (*Columbina inca*), and a roadrunner were documented. Active fields also provide cover and forage for mammals and reptiles as well as the predators that prey on them. Species that are likely to be found in the agricultural fields may include Harris's hawk, northern harrier (*Circus cyaneus*), Gambel's quail, greater roadrunner, black-tailed jackrabbit, javelina, gray fox, coyote, bobcat, skunk, various bat species, and various reptiles.

Applicable Wildlife Resources-Related Regulations

Wildlife species in Arizona are regulated and protected through State and federal laws and regulations. Species identified by AGFD as an Arizona wildlife species of concern or species of greatest conservation need that

Table 4-43 Wildlife of Special Concern in Arizona and Species of Greatest Conservation Need and Their Potential to Occur within the Project Limits

Species Common Name	Scientific Name	Status	Habitat Requirements	Occurrence: Known, Likely, Unlikely
Birds				
Abert's towhee	*Melozone aberti*	SGCN[a] Tier 1b[b]	Arroyos in desert thickets; associated with cottonwood, willow, and mesquite, although it is also found around farms, orchards, and urban areas (Audubon 2014a) Elevation range: <4,000 feet (Rosenberg et al. 1991)	Known
American bittern	*Botaurus lentiginosus*	WSC[c] SGCN Tier 1b	Marshlands and very wet meadows, along rivers, lakes, and ponds where marshy habitat is well-developed; nest in upland cover surrounding a wetland basin Elevation range: <7,000 feet (AGFD[d] 2001a)	Unlikely
American peregrine falcon	*Falco peregrinus anatum*	SGCN Tier 1a[e]	Steep, sheer rock cliffs for nesting and a large foraging area with abundant avian prey species; suitable nesting sites on rock cliffs have heights of 200 to 300 feet Elevation range: <9,000 feet (AGFD 2002a)	Unlikely
Arizona Bell's vireo	*Vireo bellii arizonae*	SGCN Tier 1b	Mesquites, desert willows, moist thickets, streamsides, and forest edges (Arizona Sonora Desert Museum 2014) Elevation range: <3,500 feet (AGFD 2002b)	Unlikely
Bald eagle	*Haliaeetus leucocephalus*	SGCN Tier 1a	Large trees or cliffs near rivers and lakes with open water and adequate food supply Elevation range: Varies (AGFD 2002c)	Known
Belted kingfisher	*Megaceryle alcyon*	WSC	Rivers, ponds, lakes, and streams with adjacent perch sites; nests in burrows along embankments Elevation range: 1,840–8,400 feet (AGFD 2007)	Unlikely
Black-bellied whistling duck	*Dendrocygna autumnalis*	WSC	Ponds, rivers, stock tanks, and marshes; nests in tree cavities, dense thickets, and on the ground near water Elevation range: 985–4,200 feet (AGFD 2002d)	Unlikely
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	WSC	Prefers mature cottonwood and willow galleries, mesquite bosques, and Sonoran desertscrub habitat Elevation range: 1,300–4,000 feet (AGFD 2001b)	Unlikely
Common black hawk	*Buteogallus anthracinus*	WSC	Dependent on mature, relatively undisturbed riparian habitat supported by a permanent flowing stream Elevation range: 1,750–7,080 feet (AGFD 2005)	Unlikely
Ferruginous hawk	*Buteo regalis*	SGCN Tier 1b	Open scrublands and woodlands, grasslands, and semidesert grassland; avoids high elevation, forest interior, and narrow canyons; breeds in northern Arizona Elevation range: 3,500–6,000 feet (AGFD 2013)	Unlikely
Gila woodpecker	*Melanerpes uropygialis*	SGCN Tier 1b	Permanent Sonora desert dweller and found in all of its habitat (Arizona Sonora Desert Museum 2008a) Elevation range: <4,000 feet (Bent 1939)	Known
Gilded flicker	*Colaptes chrysoides*	SGCN Tier 1b	Strongly associated with, but not completely restricted to, giant cactus forests of southwestern deserts (Moore 1995) Elevation range: <3,000 feet (BirdLife International 2014a)	Likely
Golden eagle	*Aguila chrysaetos*	SGCN Tier 1b	Open country, in prairies, arctic and alpine tundra, open wooded country and barren areas, especially in hilly or mountainous regions; nests on rock ledges, cliffs, or in large trees; found in mountainous areas and are virtually vacant after breeding in some desert areas (AGFD 2002e) Elevation range: 4,000–10,000 feet (AGFD 2002e)	Unlikely
Great egret	*Ardea alba*	WSC	Marshes, streams, lakes, rivers, ponds, fields, and meadows Elevation range: <1,500 feet (AGFD 2002f)	Known
Least bittern	*Ixobrychus exilis*	WSC	Dense cattail/bulrush marshes interspersed with open water Elevation range: 850–1,500 feet (AGFD 2004a)	Unlikely

[a] species of greatest conservation need [b] Species ranked as vulnerable, and does not fall into any of the Tier 1a categories [c] wildlife of special concern; species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines. [d] Arizona Game and Fish Department [e] Species ranked as vulnerable and federally listed as endangered, threatened, or candidate under the Endangered Species Act; is covered under a signed conservation agreement or a signed conservation agreement with assurances; recently removed from Endangered Species Act and currently requires post-delisting monitoring; or closed season species (i.e., no take permitted) as identified in Arizona Game and Fish Commission Orders 40, 41, 42 or 43.

(continued on next page)

Table 4-43 Wildlife of Special Concern in Arizona and Species of Greatest Conservation Need and Their Potential to Occur within the Project Limits (continued)

Species Common Name	Scientific Name	Status	Habitat Requirements	Occurrence: Known, Likely, Unlikely
Le Conte's thrasher	*Toxostoma lecontei*	SGCN Tier 1b	Desertscrub, creosote flats, mesquite, tall riparian brush (The Cornell Lab of Ornithology 2014a) Elevation range: <3,800 feet (BirdLife International 2014b)	Likely
Lincoln's sparrow	*Melosppiza lincolnii*	SGCN Tier 1b	Winters in areas with dense vegetation and overgrown fields (Phillips and Comus 2000) Elevation range: not available	Known
Mississippi kite	*Ictinia mississippiensis*	WSC	Tall woodlands, prairies, semiarid rangelands, shelterbelts, wooded areas bordering lakes and streams, mesquite bosques, and lowland/floodplain forests; breeds in riparian deciduous forests that border desertscrub upland habitats Elevation range: 1,400–3,040 feet (AGFD 2003a)	Unlikely
Osprey	*Pandion haliaetus*	WSC	Dense cattail/bulrush marshes interspersed with open water Elevation range: 850–1,500 feet (AGFD 2004b)	Likely
Pacific wren	*Troglodytes pacificus*	SGCN Tier 1b	Dense tangles and thickets in coniferous and mixed forests (Audubon 2014b) Elevation range: not available	Unlikely
Savannah sparrow	*Passerculus sandwichensis rufofuscus*	SGCN Tier 1b	Variety of open habitats, marshes, and grasslands (AGFD 2002g) Elevation range: 2,800–7,500 feet	Likely
Snowy egret	*Egretta thula*	WSC	Tall woodlands, prairies, semiarid rangelands, shelterbelts, wooded areas bordering lakes and streams, mesquite bosques, and lowland/floodplain forests; breeds in riparian deciduous forests that border desertscrub upland habitats Elevation range: 1,400–3,040 feet (AGFD 2003b)	Known
Western burrowing owl	*Athene cunicularia hypugaea*	SGCN Tier 1b	Variety of habitat such as well-drained grasslands, deserts, prairies, and agricultural land; sometimes found near vacant lots and golf courses Elevation range: 650–6,140 feet (AGFD 2001c)	Known
Western snowy plover	*Charadrius alexandrines nivosus*	WSC	Near water bodies containing fish in a variety of habitats; typically nests in conifer trees along rivers or lakes Elevation range: 800–8,300 feet (AGFD 2002h)	Likely
Wood duck	*Aix sponsa*	SGCN Tier 1b	Wooded, freshwater habitats with an abundance of cover (AGFD 2010a) Elevation range: 2,150–5,150 feet	Unlikely
Yellow warbler	*Dendroica petechia*	SGCN Tier 1b	Open habitats, marshes, grasslands, meadow, tundra, bogs, and cultivated grassy areas; may occupy Sonoran Desertscrub and farm fields (The Cornell Lab of Ornithology 2014b) Elevation range: 2,800–7,500 feet (AGFD 2002i)	Likely
Amphibians				
Great Plains narrow-mouthed toad	*Gastrophryne olivacea*	WSC	Mesquite semidesert grassland to oak woodland near streams, springs, or rain pools Elevation range: <4,700 feet (AGFD 2003c)	Unlikely
Lowland burrowing treefrog	*Pternohyla fodiens*	WSC	Mesquite grasslands associated with large washes Elevation range: <4,900 feet (AGFD 2003d)	Unlikely
Lowland leopard frog	*Lithobates yavapaiensis*	SGCN Tier 1a	Natural and human-made aquatic systems with relatively permanent water Elevation range: <8,200 feet (AGFD 2006a)	Likely
Sonoran Desert toad	*Bufo alvarius*	SGCN Tier 1b	Sonoran Desertscrub, semidesert grasslands, oak, and occasionally pine-oak woodlands; found from valley bottoms well into lower-elevation hills and mountains Elevation range: <5,800 feet (Brennan and Holycross 2006)	Likely
Mammals				
American beaver	*Castor canadensis*	SGCN Tier 1b	Once nearly extirpated from Arizona, through introductions and natural colonization, species occurs in several permanent streams, large river stretches, shallow lakes, and even a few dirt-lined canals (AGFD 2014) Elevation range: varies	Unlikely

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Table 4-43 Wildlife of Special Concern in Arizona and Species of Greatest Conservation Need and Their Potential to Occur within the Project Limits (continued)

Species Common Name	Scientific Name	Status	Habitat Requirements	Occurrence: Known, Likely, Unlikely
Antelope jackrabbit	*Lepus alleni*	SGCN Tier 1b	Drier areas of the desert, including creosote bush flats, mesquite grassland, and cactus plains; open places with sparse grasses (Rosenblum 2008) Elevation range: <4,900 feet (Rosenblum 2008)	Likely
Arizona myotis	*Myotis occultus*	SGCN Tier 1b	Found along permanent water or in riparian forest in some desert areas (AGFD 2003e) Elevation range: most common between 6,000 and 9,000 feet, but records exist between 150 and 3,500 feet (AGFD 2003e)	Unlikely
Arizona pocket mouse	*Perognathus amplus*	SGCN Tier 1b	Occurs in sandy desertscub with sparse vegetation (Lazaroff 1998) Elevation range: not available	Likely
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	SGCN Tier 1b	Occurs in open desertscrub, creosote flats, and areas with well-developed grasslands and scattered shrubs (Findley et al. 1975; Lazaroff 1998) Elevation range: not available	Likely
California leaf-nosed bat	*Macrotus californicus*	SGCN Tier 1b	Sonoran desertscrub; roosts in mines, caves, and rock shelters Elevation range: <4,000 feet (AGFD 2001d)	Likely
Cave myotis	*Myotis velifer*	SGCN Tier 1b	Desertscrub of creosote, brittlebush, palo verde, and cacti; roosts in caves, tunnels, mine shafts, under bridges, and sometimes in buildings within a few miles of water Elevation range: 300–5,000 feet (AGFD 2002j)	Likely
Greater western mastiff bat	*Eumops perotis californicus*	SGCN Tier 1b	Lower and upper Sonoran Desertscrub near cliffs, preferring rugged rocky canyons with abundant crevices Elevation range: 240–8,475 feet (AGFD 2002k)	Likely
Harris's antelope squirrel	*Ammospermophilus harrisii*	SGCN Tier 1b	Rocky habitats of the desert containing shrubs and cactus (Arizona-Sonora Desert Museum 2008b) Elevation range: <1,350 feet (Best et al. 1990)	Likely
Jaguar	*Panthera onca*	SGCN Tier 1a	Closely associated with rivers and cienegas occurring in desertscrub to pine/oak woodlands (AGFD 2004c) Elevation range: most recently found between 5,200 and 5,700 feet (AGFD 2004c)	Unlikely
Kit fox	*Vulpes macrotis*	SGCN Tier 1b	Desertscrub, chaparral, and grasslands; saltbrush and sagebrush communities; may occur in agricultural areas and urban environments; prefer areas with loose soils for digging dens (Patton 2008) Elevation range: 1,300–6,200 feet (Patton 2008)	Likely
Mexican free-tailed bat	*Tadarida brasiliensis*	SGCN Tier 1b	A lowland species that sometimes ranges into highlands, in desertscrub, coniferous forests, and coniferous woodlands; roosts in caves, mines, crevices in bridges, parking garages, and buildings Elevation range: <9,200 feet (AGFD 2004d)	Likely
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	SGCN Tier 1b	Caves and mines from desertscrub up to woodlands and coniferous forests; night roosts may often be in abandoned buildings Elevation range: 550–7,520 feet (AGFD 2003f)	Likely
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	SGCN Tier 1b	Desertscrub and arid lowland habitats; roosts in crevices high on cliff faces in rugged canyons, large and small water tanks, creek pools, and along rivers, washes, and ephemeral pools Elevation range: 190–7,520 feet (AGFD 2011a)	Likely
Spotted bat	*Euderma maculatum*	SGCN Tier 1b	Dry, rough desertscrub, sometimes ponderosa pine forest, high desert, and riparian habitats; may roost in crevices in cliff faces Elevation range: 110–8,670 feet (AGFD 2003g)	Likely
Western red bat	*Lasiurus blossevillii*	SGCN Tier 1b	Riparian and wooded areas; roosts in tree foliage Elevation range: 1,900–7,200 feet (AGFD 2003h)	Likely
Western yellow bat	*Lasiurus xanthinus*	SGCN Tier 1b	Urban areas with palm trees and low- to mid-elevation riparian habitats with broad leaf trees; roosts in leaf skirts of palm trees Elevation range: <6,000 feet (AGFD 2003i)	Likely

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Table 4-43 Wildlife of Special Concern in Arizona and Species of Greatest Conservation Need and Their Potential to Occur within the Project Limits (continued)

Species Common Name	Scientific Name	Status	Habitat Requirements	Occurrence: Known, Likely, Unlikely
Yuma myotis	*Myotis yumanensis*	SGCN Tier 1b	Riparian, desertscrub, moist woodlands and forests, cliffs and rocky walls near water Elevation range: 180–4,940 feet (AGFD 2011b)	Likely
Reptiles				
Arizona skink	*Eumeces gilberti arizonensis*	WSC	Mesquite riparian drainages to oak and pine woodlands with rocks, logs, and leaf litter near streams Elevation range: 1,865–1,970 feet (AGFD 2003j)	Likely
Gila monster	*Heloderma suspectum*	SGCN Tier 1a	Sonoran Desert, undulating rocky foothills, bajadas, and canyons; less frequent or absent on open sandy plains Elevation range: <5,000 feet (AGFD 2002l)	Likely
Goode's horned lizard	*Phrynosoma goodei*	SGCN Tier 1b	Flat, open areas with sandy or loamy soil; less frequently encountered on rocky bajadas and foothills Elevation range: <2,000 feet (Brennan and Holycross 2006)	Unlikely
Northern Mexican gartersnake	*Thamnophis eques megalops*	WSC	Desert grassland with dense vegetation around cienegas, streams, and stock tanks Elevation range: 3,000–8,500 feet (AGFD 2001e)	Unlikely
Regal horned lizard	*Phrynosoma solare*	SGCN Tier 1b	Valleys, rocky bajadas, and low foothills, relatively level areas with low shrubs, and open, sunny patches Elevation range: 900–4,500 feet (Brennan and Holycross 2006)	Likely
Saddled leaf-nosed snake	*Phyllorhynchus browni*	SGCN Tier 1b	Found above the flats in foothills and on moderate bajadas Elevation range: 1,000–3,000 feet (Brennan and Holycross 2006)	Unlikely
Sonora mud turtle	*Kinosternon sonoriense*	SGCN Tier 1b	Occurs in most of southeastern Arizona and sub Mogollon Rim in central Arizona; found in the Salt and Gila rivers and their tributaries (Brennan and Holycross 2006) Elevation range: <6,500 feet	Likely
Sonoran coralsnake	*Micruroides euryxanthus*	SGCN Tier 1b	Above flats in or near rocky or gravelly drainages, mesquite-lined washes, and canyons; abundant in rocky Arizona upland desert and bajadas Elevation range: <6,000 feet (AGFD 2008)	Likely
Sonoran whipsnake	*Masticophis bilineatus*	SGCN Tier 1b	Found above the flats on mountain slopes and canyons, in foothills, along ridges, and on steep rocky bajadas Elevation range: 1,000–7,000 feet (Brennan and Holycross 2006)	Likely
Tiger rattlesnake	*Crotalus tigris*	SGCN Tier 1b	Rocky slopes or washes in rocky mountains and foothills; occasionally found in desert flatlands, rarely stray more than a mile from foothills, mountains, or rocky habitat Elevation range: 1,000–5,000 feet (Brennan and Holycross 2006)	Likely
Variable sandsnake	*Chilomeniscus stramineus*	SGCN Tier 1b	Above the flats in or near drainages and canyons with loose gravel or sand substrates Elevation range: 200–3,000 feet (Brennan and Holycross 2006)	Likely
Fish				
Little Colorado sucker	*Catostomus* sp. 3	WSC	Small to medium rivers and impoundments mostly in pools with abundant cover but also found in riffles Elevation range: 2,200–7,350 feet (AGFD 2001f)	Unlikely

are likely or known to occur in the area affected by the action alternatives are listed in Table 4-43. Federally listed species that may occur in the area affected by the action alternatives are listed in Table 4-44. A Biological Evaluation was prepared following publication of the DEIS that analyzed potential impacts to these species in the area identified as the Preferred Alternative (see sidebar on page 4-2 for information on how to review the report). Federally listed threatened and endangered species are also Arizona wildlife species of concern but are not included in Table 4-43 because they are addressed separately in Table 4-44.

Arizona Wildlife of Special Concern

A wildlife of special concern species is an animal species whose occurrence in Arizona is or may be in jeopardy or is one with known or perceived threats or population declines, as described in AGFD's Heritage Data Management System. A brief description of the natural history of wildlife of special concern species is provided in Table 4-43.

Endangered Species Act

The federal Endangered Species Act (ESA), as amended, is designed to protect critically at-risk species from extinction. In addition to protecting these listed species, it protects their habitat. The ESA forbids federal agencies from authorizing, funding, or carrying out actions that may jeopardize endangered species and forbids any agency, corporation, or citizen from "taking" (harming, harassing, or killing) listed species without a permit. Protected species are designated as:

- **Endangered** – A plant or animal species that is in danger of extinction throughout all or a significant portion of its range.
- **Threatened** – A plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- **Proposed** – A plant or animal species that is being proposed for listing as threatened or endangered.
- **Candidate** – A review status of a plant or animal species for which USFWS has on file substantial information concerning the biological vulnerability and threat(s) to support the appropriateness of proposing to list a species as endangered or threatened.

The ESA also allows for protection of habitat considered critical to the preservation of designated species. *Critical habitat* is a term defined in the ESA as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species. (USFWS 1988)

There is no critical habitat designated in or adjacent to the Study Area for any threatened or endangered species.

A letter regarding special-status plant and animal species that could occur within a 5-mile radius of the Study Area was received from AGFD in January 2002. A revised list was received in October 2004, and included those within a 2-mile radius. In August 2011, the AGFD Environmental Review On-Line Tool was accessed to define those species within a 3-mile radius of the action alternatives. Information gathered from AGFD and the USFWS list of threatened, endangered, candidate, and proposed species (threatened and endangered species) for Maricopa County, 2011, were used as the basis for determining which species and habitat to evaluate when considering the action alternatives. Correspondence from AGFD and USFWS is in Appendix 1-1.

Discussed in the following sections are plant and animal species that are proposed for listing or are listed as threatened, endangered, or candidate species by USFWS (2013). All species listed by USFWS as occurring or potentially occurring in Maricopa County are presented in Table 4-44. Some species have been documented within a 3-mile radius of the action alternatives; the exact locations, however, are not shown in this report because of the sensitive nature of the information. These threatened, endangered, or candidate species are presented below.

Yuma clapper rail (*Rallus longirostris yumanensis*)

Source: USGS[39]
Photo by J. A. Spendlow

The Yuma clapper rail has a range in Arizona that encompasses several major river drainages in central and southwestern Arizona, including the lower Gila and Salt rivers. Habitat requirements include freshwater and brackish marsh habitat, with nests built in dense vegetation near water's edge (AGFD 2006b). The main threats to the Yuma clapper rail are loss and alteration of marshland habitat.

Breeding pairs have been documented from the 91st Avenue WWTP west to the confluence of the Salt and Gila rivers, where several large artificial ponds have developed in the Salt River as a result of active gravel mining operations. Although these ponds may provide some value as aquatic habitat for water birds, they lack the dense marshland vegetation required by Yuma clapper rails for foraging and nesting. Furthermore, the future of these ponds is uncertain and would be expected to change with ongoing gravel mining operations.

Yellow-billed cuckoo (*Coccyzus americanus occidentalis*)

Source: USGS[40]
Photo by Jim Rorabaugh

The yellow-billed cuckoo is a migrant that arrives in Arizona from South America in late May to late June to establish breeding territories; it leaves breeding areas in late August to late September. In Arizona, it ranges from the southern and central part of the state to the extreme northeast (Monson and Phillips 1981). Preferred habitat in Arizona includes mature cottonwood, willow, or mesquite woodlands near water (AGFD 2002m). The yellow-billed cuckoo population is declining throughout its range because of loss and alteration of habitat.

Yellow-billed cuckoos are known to inhabit portions of the Salt and Gila rivers between 83rd and 115th avenues. Historically, the lower Salt River supported mature riparian woodlands that would have provided suitable habitat for the yellow-billed cuckoo. More recently, habitat alteration and

Table 4-44 Threatened and Endangered Species Potentially Occurring in Maricopa County

Species Common Name	Scientific Name	Habitat	Federal Status	Occurrence: Known or Potential
Birds				
California least tern	*Sterna antillarum browni*	Bare or sparsely vegetated sand, sandbars, gravel pits, or exposed flats along shorelines of inland rivers, lakes, reservoirs, or drainage systems	Endangered	Most likely to occur as migrants; occasional breeding documented in Arizona; not documented near action alternatives
Mexican spotted owl	*Strix occidentalis lucida*	Canyons and dense forests	Threatened	No canyons or forests within the Study Area; no occurrence within Study Area
Southwestern willow flycatcher	*Empidonax traillii extimus*	Riparian communities along rivers and streams	Endangered	Not documented near action alternatives; no suitable habitat
Sprague's pipit	*Anthus spragueii*	Native grasslands with vegetation of intermediate height and lacking woody shrubs	Candidate	Not known to breed in Arizona; in Arizona found wintering mainly in the southeastern grasslands; only a few wintering individuals have been found, in alfalfa fields near Phoenix (AGFD[a] 2010b)
Yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Open woods and stream sites	Proposed Threatened	Migratory; known to occasionally occur on portions of the Salt and Gila rivers, west of 83rd to 115th avenues
Yuma clapper rail	*Rallus longirostris yumanensis*	Fresh water and brackish marshes	Endangered	Suitable habitat exists and individuals have been documented in 2008 and 2009 from 91st Avenue Wastewater Treatment Plant to the Salt River-Gila River confluence
Plants				
Acuna cactus	*Echinomastus erectocentrus* var. *acunensis*	Well-drained knolls and gravel ridges in Sonoran desertscrub; elevation 1,198 to 3,773 feet	Endangered	Species not within known range in Maricopa County or its anticipated potential habitats (*Federal Register* 78(190):60608–60652)
Arizona cliffrose	*Purshia subintegra*	Rolling, rocky limestone lakebed deposits; elevation 2,120 to 4,000 feet	Endangered	No occurrence within Study Area because of a lack of suitable habitat
Mammals				
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Desert scrub habitat at <6,000 feet; roosts in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave and columnar cacti are present	Endangered	No occurrence within Study Area because of a lack of suitable habitat
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Alluvial valleys with Sonoran creosotebush-bursage and Sonoran paloverde-mixed cacti/Sonoran cresotebush-bursage associations	Endangered	No occurrence within Study Area because of a lack of suitable habitat
Fish				
Desert pupfish	*Cyprinodon macularius*	Shallow springs, small streams, and marshes	Endangered	Transplanted into the Salt River in 1958 but no longer found in the Salt River Basin, including the Study Area
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	Small streams, springs, and cienegas with vegetated shallows	Endangered	Stocked in the Salt River in Tempe in 1966, but no longer found in the Salt/Gila River basin, including the Study Area (USFWS[b] 1998)
Razorback sucker	*Xyrauchen texanus*	Riverine and lacustrine areas, generally not in fast-moving water; may use backwaters	Endangered	Historically occurred within Gila River drainage and Salt River; now, populations only in Lakes Mohave and Mead; no occurrence in Study Area
Roundtail chub	*Gila robusta*	Cool to warm waters of rivers and streams; often occupies deepest pools and eddies of large streams	Candidate	Only populations in the Little Colorado River, Bill Williams, and Gila River basins are candidate species; no occurrence in Study Area
Woundfin	*Plagopterus argentissimus*	Shallow, warm, turbid, and fast-flowing water	Endangered	Experimental nonessential populations designated in portions of Gila River; no occurrence in Study Area
Reptiles				
Desert tortoise (Sonoran Desert population)	*Gopherus morafkai*	Rocky hillsides of Sonoran desertscrub	Candidate	Occur in Eastern Section of Study Area along slopes of Phoenix South Mountain Park/Preserve
Tucson shovel-nosed snake	*Chionactis occipitalis klauber*	Sonoran desertscrub, soft sandy soils with sparse gravel, creosotebush-mesquite floodplains, creosotebush flats with firm soils (see AGFD comment letter on page B64 in Appendix 7, Volume III)	Candidate	Potential habitat along Salt River floodplain in Western Section and between mountain ridges near Phoenix South Mountain Park/Preserve in the Eastern Section

Source: U.S. Fish and Wildlife Service (USFWS) list of threatened and endangered species in Maricopa County, <fws.gov/southwest/es/arizona/Documents/CountyLists/Maricopa.pdf>; species status confirmed using the USFWS Information, Planning, and Conservation System Web site <ecos.fws.gov/ipac>; accessed on July 29, 2014.

[a] Arizona Game and Fish Department [b] U.S. Fish and Wildlife Service

disruption of water flow throughout the lower Salt River have created unsuitable habitat for this species. While few mature riparian trees can be found scattered in the riverbed, especially near remnant sources of water, they generally do not compose the dense gallery forests needed. Suitable habitat does exist at the Tres Rios demonstration wetlands, the Salt River-Gila River confluence, and along scattered segments of the Gila River.

Desert tortoise – Sonoran population (*Gopherus morafkai*)

Source: HDR Engineering, Inc. Photo by Eric Herman

The Sonoran population of desert tortoises was listed as a candidate species in December 2010. This distinction describes populations located east and south of the Colorado River in Arizona. Suitable habitat for this species includes rocky, steep slopes and bajadas in areas of Sonoran paloverde-mixed cacti desertscrub (AGFD 2011d). Threats to this species include predation, illegal collection, loss of habitat attributable to development, degradation of habitat attributable to human activities, and nonnative plant species invasions (AGFD 2011d). Sonoran desert tortoises have been documented within the Eastern Section of the Study Area, along the slopes of SMPP (AGFD 2009).

Tucson shovel-nosed snake (*Chionactis occipitalis klauberi*)

Source: USFWS[41] Photo by Erik Enderson

The Tucson shovel-nosed snake was listed as a candidate species in March 2010 and is currently under review for listing as threatened or endangered. Its current range includes Pima, western Pinal, and eastern Maricopa counties, with a majority of its range believed to occur in a swath of land between Tucson and Phoenix (AGFD 2010c). Although this species is adapted to burrowing in loose sand or soil (AGFD 2010c) in Sonoran desertscrub or creosotebush-mesquite floodplains (USFWS 2013), it is believed that creosotebush flats, with firmer soils, are also used as habitat (see AGFD comment letter on page B64 in Appendix 7, Volume III). Potential Tucson shovel-nosed snake habitat near the action alternatives occurs along the Salt River in the Western Section and between the mountain ridges near SMPP in the Eastern Section. Loss of potential habitat for the Tucson shovel-nosed snake may occur as a result of the proposed action. Major threats to the Tucson shovel-nosed snake include agricultural expansion, urban development, and road construction, use, and maintenance [AGFD 2010c; *Federal Register* 75(61):16050–16065].

Migratory Bird Treaty Act of 1918

The 1916 Migratory Birds Convention between the United States and Great Britain (acting for Canada) for the protection of migratory birds set the terms for and facilitated legislation later enacted in the United States as the Migratory Bird Treaty Act (MBTA) of 1918. Later amendments implemented treaties between the United States and Mexico, the United States and Japan, and the United States and the Soviet Union (now Russia).

Specific provisions in the statute include establishment of a federal prohibition, unless permitted by regulations, to:

> pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof, included in the terms of the conventions between the United States and Great Britain for the protection of migratory birds . . . . 16 U.S.C. § 703[a])

Habitat destruction and alteration do not qualify as a take as long as these activities involve no loss of birds, eggs, or nests (FHWA 2001b). Birds protected under the act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs (50 C.F.R. § 10.13).

Federal-aid highway projects such as the proposed action with the potential to result in take of birds protected under the MBTA require the issuance of take permits from USFWS. Freeway project activities that would likely result in take of migratory birds include land clearing, bridge demolition, or reconstruction/retrofitting undertaken during the nesting season (FHWA 2001b). A wide range of migratory birds, including the western burrowing owl, are expected to occur within and adjacent to the Study Area. Necessary avoidance measures would be undertaken and permits would be acquired, as necessary, from the USFWS MBTA permits office in Albuquerque, New Mexico.

Bald and Golden Eagle Protection Act

Although they are protected under the MBTA, bald eagles receive additional protection under the Bald and Golden Eagle Protection Act, enacted in 1940. The Act prohibits pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing eagles. The National Bald Eagle Management Guidelines state that "disturbing" also includes impacts resulting from human-induced alterations initiated near a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment (USFWS 2007).

Source: USFWS[42] Photo by John and Karen Hollingsworth

The bald eagle can be found throughout Arizona; however, breeding areas are primarily located within the central part of the state along the Salt and Verde rivers (AGFD 2002c). Until 2010, nesting bald eagles had not been documented near the action alternatives, although migrating bald eagles—individuals of the winter population—have occasionally occurred along the Salt River (AGFD 2009). In January 2010, an eagle nest with eggs was observed near the confluence of the Gila and Salt rivers within the Study Area. The eagles successfully nested again in 2011. From those two nesting occurrences, three young eagles left the nest.[43] The nest is located within approximately 1 mile of the W101 Alternative crossing of the Salt River. The Salt River and artificial pits that have been created by mining activities provide foraging habitat when water is present. Foraging habitat is present within the Study Area year-round along the Salt River from the 91st Avenue WWTP downstream to the confluence of the Gila River because of continuous effluent discharges; however, the Salt River is typically dry upstream where the action alternative crossings are located, according to a June 8, 2012, aerial photograph. The gravel mining pits retain water for longer periods. These pits become continually smaller during dry periods, and competition with numerous other fish-eating birds, such as herons, egrets, and cormorants, makes these pits less productive habitat. The future of these pits is uncertain and would be expected to change with ongoing gravel mining operations.

The golden eagle (*Aquila chrysaetos*) has the potential to occur in the Study Area for brief periods as a transient because of the species' wide-ranging habit and large territory; suitable habitat to support the golden eagle is limited within the Study Area.

ENVIRONMENTAL CONSEQUENCES

Action Alternatives, Western and Eastern Sections

Sonoran desert tortoises have been documented in the Eastern Section of the Study Area, and suitable habitat for this species is present within SMPP and the foothills of the South Mountains. The E1 Alternative would directly affect suitable habitat as it crosses SMPP and would be expected to affect individuals of this species. Suitable habitat for the Tucson shovel-nosed snake also occurs along the Salt River floodplain in the Western Section and in the creosotebush flats between the mountain ridges near SMPP in the Eastern Section. All of the action alternatives would affect suitable habitat crossing the Salt River in the Western Section, and the E1 Alternative would affect suitable habitat on the western end of SMPP.

No other federally listed threatened or endangered species have been documented in the proposed R/W of any of the action alternatives and options. The Yuma clapper rail and yellow-billed cuckoo have been documented west of the action alternatives and options along the Salt River and would not be affected by construction activities or freeway operation. Additionally, there is no critical habitat designated in the Study Area. Therefore, within the limits of construction and operational disturbance, the proposed action may affect Sonoran desert tortoises and Tucson shovel-nosed snakes, but would have no effect on any other threatened and endangered species as defined under Section 7 of the ESA.

Bald eagles have been documented nesting along the Salt River within 1 mile of the W101 Alternative. These eagles likely forage along the Salt River within the Study Area. Although the action alternatives are not expected to affect the nesting activities of these eagles because of the project's distance from the nest, the project may affect their foraging behavior along the Salt River when foraging opportunities exist near action alternatives.

Because the Bald and Golden Eagle Protection Act addresses the take of eagles as a result of direct disturbance to individuals or their nests, and the golden eagle has no suitable habitat near any of the action alternatives, the proposed freeway would have no effect on the golden eagle or their nests.

General Impacts on Vegetation, Wildlife, and Wildlife Habitat

Within the context of overall vegetation, wildlife, and wildlife habitat, all action alternatives and options would decrease the amount of cover, nesting areas, and food resources for wildlife species caused by habitat loss, fragmentation, and traffic disturbance. During construction activities, noise disturbance would represent a short-term impact on the environment. The duration and level of construction noise would depend on the activities, such as blasting, ground clearing, utility relocations, the placement of roadbeds and foundations, and construction of structures. Noise may have a temporary impact on nesting birds adjacent to construction. Operation of the freeway would cause a long-term increase in noise levels that would vary in intensity depending on factors such as time of day and day of the week. Nighttime noise levels, excluding evening periods, would be less than daytime noise levels; therefore, species active during daytime periods may be affected more than species active at night. Some species rely on hearing to avoid predators, communicate, and find food (Noise Pollution Clearinghouse 2004). An increase in traffic noise may affect the ability of some animals to hear at a level necessary for survival when near the proposed action. In addition, hearing loss resulting from vehicle noise has been shown to occur in some desert animals (Bondello and Brattstrom 1979).

The magnitude of impacts associated with each of the action alternatives and options would be comparable because of their similar type and size of physical footprint on the land and because of similarities in roadway design and traffic volumes on the proposed freeway. In the Eastern Section of the Study Area, the E1 (Preferred) Alternative would affect wildlife because of the presence of undeveloped areas and open space land uses along the SMPP and Community boundaries—the areas with the most natural habitat.

Construction of any action alternatives and options would involve vegetation removal and would cause a decrease in habitat, foraging, and nesting resources for wildlife. Along and within the Salt River, the W101, W71, and W59 (Preferred) Alternatives would modify former gravel pits used by birds as a local water source. It is likely that

Habitat Connectivity and the Proposed Action

Support has grown among State and federal agencies, as well as the general public, for maintaining landscape connectivity as it pertains to wildlife movement. It is known that roads in general reduce the movement of wildlife and can fragment habitat, isolate wildlife populations, and ultimately diminish landscape connectivity (Clevenger and Huijser 2011).

As Arizona has experienced record growth in population, the need to preserve wildlife diversity is on the forefront. As early as 2003, wildlife experts from various agencies and organizations throughout the state met to address wildlife habitation fragmentation within Arizona. Representatives from AGFD, ADOT, FHWA, BLM, USFWS, U. S. Department of Agriculture, Northern Arizona University, and the Wildlands Project developed Arizona's Wildlife Linkages Assessment (Arizona Wildlife Linkages Workgroup 2006) that included the Salt River within the Study Area as a Potential Linkage Zone, Linkage 151, which would allow wildlife movement between the fractured habitats resulting from development in metropolitan Phoenix. Additionally, a report supported by AGFD and the Arizona Wildlife Linkages Workgroup, entitled *The Maricopa County Wildlife Connectivity Assessment: Report on Stakeholder Input* (AGFD 2012), summarizes a workshop attended by a broad range of organizations and interests that interactively provided input and mapping for important wildlife linkages across Maricopa County. The report identifies the area between SMPP and the Sierra Estrella as Landscape Movement Area 53 and the Salt River as Riparian Movement Area 16.

Example of a typical small-animal crossing

ADOT has implemented several mitigation measures in the wildlife connectivity report (AGFD 2012). To support efforts and information addressing habitat connectivity and wildlife movement, the proposed action would include wildlife friendly crossing structures in the design (see Figure 4-38).

The proposed action would cross the Salt River in the Western Section. The City of Phoenix and USACE are currently in the planning phases for the Rio Salado Oeste project, an approximately 8-square-mile habitat restoration project located in the 100-year floodplain along the Salt River, between 19th and 83rd avenues. The intent of the project is native riparian habitat restoration in conjunction with flood control, water quality, and passive recreation in the form of multiuse trails. The City and USACE have anticipated a South Mountain Freeway crossing and view it as an opportunity to direct stormwater runoff from the proposed freeway to "irrigate" the river habitat. Piers for the proposed freeway bridge structure would be constructed within the Rio Salado Oeste project area, but the bridge would span the area. As planning progresses, the City and USACE have agreed to coordinate with ADOT during design to assess opportunities for the combined projects to provide more benefit to wildlife.

Example of a typical large-animal crossing

Several locations were examined for potential wildlife crossings that could be accommodated in the Eastern Section, generally along the South Mountains (see Figure 4-38). Potential surface drainage crossing the freeway would be accommodated by a series of culverts and box culverts along natural washes. After examination of these locations, some of the crossings were reexamined in further detail, and preliminary designs were altered by either expanding the culverts or by replacing them with bridges to enhance habitat connectivity opportunities. The design of the wildlife crossing structures and associated fencing would be completed in coordination with AGFD, the Community, and USFWS.

birds would continue to use these pits, depending on the availability of water, or would use other existing surface water habitats such as the Tres Rios constructed wetlands or similar habitat located farther downstream.

The proposed action would not adversely affect the Yuma clapper rail or its habitat because no suitable habitat exists adjacent to or within the action alternative alignments. Direct impacts such as freeway noise are not likely to adversely affect the Yuma clapper rail because of a 2,000-foot separation between the nearest suitable Yuma clapper rail habitat and the closest action alternative, the W101 Alternative. If constructed, the Rio Salado Oeste restoration project may create suitable habitat conditions within the Salt River from approximately 83rd Avenue east through the Study Area, and the Tres Rios demonstration wetlands project will restore suitable habitat from the 91st Avenue WWTP west to the confluence of the Agua Fria River with the Gila River.

The proposed action would not affect the yellow-billed cuckoo or its habitat because insufficient suitable habitat exists immediately adjacent or within the action alternative alignments. Impacts such as noise and increased activity in the Study Area would have no effect because of the approximately 1,300-foot separation between the nearest documented species occurrence and the W101 Alternative.

Sonoran desert tortoises have been documented in the Eastern Section of the Study Area, and construction of the E1 Alternative could affect individuals of this species. The E1 Alternative would directly affect suitable habitat as it crosses SMPP.

The proposed action could affect individuals of Tucson shovel-nosed snake because suitable habitat would be directly affected by all Western Section action alternatives that cross the Salt River as well as the E1 Alternative where it crosses undeveloped desertscrub habitat.

The proposed action may cause bald eagles to alter their foraging activity because of the presence of a busy freeway corridor; however, the potential for foraging exists only if water is present and forage species are available. The project would not affect forage species or their potential occurrence and would not remove nesting habitat. Direct impacts

such as noise and increased activity in the Study Area would be negligible because of the approximately 1-mile distance from the nest to the nearest action alternative, the W101 Alternative.

Habitat Connectivity

Impacts on biological resources caused by construction and operation of public roads include vehicle-wildlife collisions, habitat loss, and habitat fragmentation (FHWA 2011) as well as disturbances caused by traffic noise (Barber et al. 2010). A report supported by AGFD and the Arizona Wildlife Linkages Workgroup summarizes a workshop attended by a broad range of organizations and interests that interactively provided input and mapping for important wildlife linkages across Maricopa County (AGFD 2012). The report identifies the area between SMPP and the Sierra Estrella as a landscape movement area. Multifunctional crossing locations were identified to provide a potential movement corridor between SMPP and the Sierra Estrella (see Figure 4-38 for crossing locations and the text box on habitat connectivity on the previous page).

No-Action Alternative

The No-Action Alternative would result in no direct project-related impacts on biological resources. Indirectly, selection of the No-Action Alternative may increase the pace of urban expansion in some areas because some land (set aside for freeway R/W in the past by local jurisdictions) could be released and become available for development. Therefore, it is anticipated that habitat loss, fragmentation, and traffic disturbance would also occur under the No-Action Alternative.

The proposed action, however, offers an opportunity to promote wildlife connectivity with multiuse crossings that may facilitate the movement of wildlife throughout the region in the long term. Selection of the No-Action Alternative would make it less likely that such multiuse crossings would be constructed.

MITIGATION

ADOT EPG Responsibilities

- During the design phase, ADOT EPG would coordinate with USFWS, AGFD, and the Community's Department of Environmental Quality to determine whether any additional species-specific mitigation measures would be required.

ADOT EPG, Roadside Development, and Design Responsibilities

- Protected native plants within the project limits would be affected by this project; therefore, the ADOT Roadside Development Section would determine whether ADA notification would be needed. If notification were needed, the ADOT Roadside Development Section would send the notification at least 60 calendar days prior to the start of construction
- The proposed action would be designed to protect and maintain opportunities for wildlife movement between the South Mountains, the Gila River, and the Sierra Estrella. These opportunities would be located in the region where the E1 Alternative would intersect the southwestern portion of the South Mountains. Some drainage structures incorporated into the roadway plans would be designed to accommodate multifunctional crossings in appropriate locations that would allow limited use by the Community and also serve wildlife. These crossing structures and associated fences would be designed to reduce the incidence of vehicle-wildlife collisions and reduce the impact of the proposed action on wildlife connectivity between the South Mountains, the Gila River, and the Sierra Estrella. ADOT would coordinate with USFWS, AGFD, and the Community's Department of Environmental Quality during the design phase regarding the potential for locating and designing wildlife-sensitive roadway structures.
- For drainage structures such as culverts located in potential wildlife movement corridors, wildlife friendly design would be considered during final design. ADOT would coordinate with USFWS, AGFD, and the Community's DEQ during the design phase regarding the potential for locating and designing wildlife-sensitive roadway structures.
- All disturbed soils not paved that would not be landscaped or otherwise permanently stabilized by construction would be seeded using species native to the project vicinity.
- Prior to signing the ROD for the project, the status of species and critical habitat proposed, listed, or designated under the ESA would be reviewed. If new species have been proposed or listed following completion of the Biological Evaluation, an update to the Biological Evaluation would be prepared and any required consultation with USFWS would be completed.
- During final design of the project and within 90 days of approval to begin construction of each phase of the project, the status of species and critical habitat proposed, listed, or designated under the ESA would be reviewed. If new species or critical habitat have been proposed, listed, or designated following completion of the Biological Evaluation, or if the potential effects on species or critical habitat from the project have changed from those described in the Biological Evaluation, an update to the Biological Evaluation would be prepared and any required consultation with USFWS would be completed.
- Prior to construction, ADOT EPG would arrange for surveys to be completed for the Sonoran desert tortoise, Tucson shovel-nosed snake, bats, and other species as determined by ADOT or FHWA to be necessary.
- During the design phase, ADOT would coordinate with USFWS, AGFD, and the Community's Department of Environmental Quality and determine whether any additional species-specific mitigation measures would be required.
- During the design phase, ADOT EPG would review and update biological requirements for the project, completing bird surveys as necessary, and developing species-specific mitigation measures to minimize potential impacts to birds protected under the MBTA.
- ADOT would provide the contractor's personnel training regarding procedures for interactions with sensitive species that may be encountered during construction.

ADOT District and Contractor Responsibilities

- If clearing, grubbing, or pruning of trees, shrubs, or cacti would occur between March 1 and August 31, a qualified biologist would conduct a bird nest search of all vegetation that would be cleared or pruned within 5 calendar days prior to vegetation clearing/pruning. If an active nest or nest cavity/hole of birds protected by the MBTA were observed, the vegetation clearing/pruning would be delayed in the immediate vicinity until the nest is no longer active or a relocation permit would be obtained from USFWS by the contractor..
- To prevent the introduction of invasive species seeds, the contractor would inspect all earthmoving and hauling equipment at the equipment storage facility and the equipment would be washed prior to entering the construction site.
- To prevent invasive species seeds from leaving the site, the contractor would inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to leaving the construction site.
- All disturbed soils not paved that would not be landscaped or otherwise permanently stabilized by construction would be seeded using species native to the project vicinity.
- Habitat impacts would be minimized by restricting construction activities to the minimum area necessary to perform the activities and by maintaining natural vegetation where possible.
- If any Sonoran desert tortoises were encountered during construction, the contractor would adhere to the most current guidelines regarding encounters with Sonoran desert tortoises.
- The contractor would adhere to the procedures for encounters with sensitive species that would include allowing the animal to leave of its own accord or contacting a trained person if the animal needed to be removed from the work area.
- A biologist would be employed to complete a preconstruction survey for burrowing owls 96 hours prior to construction in all suitable habitat that would be disturbed. The biologist shall possess a burrowing owl survey protocol training certificate issued by AGFD. Upon completion of surveys, the survey results would be reviewed with the ADOT biologist and a course of action would be identified.
- If any burrowing owls are located in the work area, the contractor would immediately stop work at that location and notify the Engineer. The Engineer would contact the ADOT biologist to determine whether the owls could be avoided or must be relocated. The contractor would not work within 100 feet of any active burrow until the situation had been evaluated by the ADOT biologist. If the ADOT biologist determined that the owl must be relocated, a biologist holding a rehabilitation permit from USFWS would relocate burrowing owls from the project area.

CONCLUSIONS

Construction and operation of any of the action alternatives would involve vegetation removal; would diminish habitat, foraging, and nesting resources for wildlife; and would continue the trend of increasing habitat fragmentation as urbanization continues around SMPP. No critical habitat is designated in or adjacent to the Study Area for any threatened or endangered species. Construction of the E1 (Preferred) Alternative could affect Sonoran desert tortoises, which have been documented in the Eastern Section of the Study Area. Construction of any of the action alternatives could affect the Tucson shovel-nosed snake given the presence of suitable habitat for this species. Wildlife species of special concern have been documented as being in or within 3 miles of the Study Area. Wildlife movement is expected to occur between the South Mountains and Sierra Estrella through the Gila River Basin. In response, multifunctional crossing locations have been identified to provide potential movement corridors under the E1 Alternative. Most impacts on wildlife and native plant communities would occur in the Eastern Section where there is more undeveloped land along the SMPP and Community boundaries—the areas with the most natural habitat. During construction activities, noise disturbance would represent a short-term impact on wildlife that would vary by location and intensity and that may affect bird and mammal activities such as nesting and foraging. During freeway operation, the increase in traffic noise would be a long-term impact on wildlife that would vary in intensity depending on factors such as time of day and day of the week. The long-term increase in traffic noise may affect the ability of some animals to avoid predators, communicate, and find food when near the proposed action. Impacts on biological resources during operation of the proposed freeway would also include vehicle-wildlife collisions and an increase in the effects of habitat fragmentation attributable to wildlife avoidance of activity associated with the freeway.

Under the No-Action Alternative, urban development would contribute to cumulative conversion of natural land/habitat in the Study Area to human-oriented uses.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

Cultural Resource Regulations

Cultural resource investigations were performed to establish the proposed action's compliance with federal laws identified below. Cultural resources generally include archaeological sites, historic buildings and structures, artifacts and objects, and places of traditional, religious, and cultural significance. *Historic property* refers to cultural resources that are listed in or eligible for listing in the NRHP.

For the proposed action, FHWA is the lead agency responsible for compliance with the National Historic Preservation Act (NHPA). Under NHPA, the lead federal agency must take into consideration the effects of its actions on historic properties (sites or places eligible for or listed in the NRHP). NHPA stipulates that the lead federal agency make determinations of NRHP eligibility and project effects in consultation with the SHPO. The State Historic Preservation Officer (also SHPO) is the appointed official in each state charged with administering the national historic preservation program mandated by NHPA.

In 1992, NHPA amendments allowed federally recognized Native American tribes to assume any or all of the functions of a SHPO with respect to tribal land [Section 101(d)(2)]. Pursuant to these amendments, the Community applied for and was granted THPO status in February 2009. As a result, federal agencies must consult with THPO in lieu of SHPO for actions occurring on, or affecting historic properties on, Community land. Consultation with an Indian tribe must respect tribal sovereignty and the government-to-government relationship between the Federal Government and Indian tribes.

National Environmental Policy Act

NEPA requires federal agencies to consider the impacts of their activities on the human environment, which includes historic properties. NEPA stipulates that:

- federal agencies work to preserve important historical and cultural aspects of our national heritage [Section 101(b)(4)]
- compliance studies involving historic properties require coordination with other preservation laws such as NHPA

National Historic Preservation Act

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and afford SHPO and/or THPO and other parties with a demonstrated interest a reasonable opportunity to comment on such undertakings. Section 106 compliance is implemented through the regulations for *Protection of Historic Properties* (36 C.F.R. Part 800). To be determined eligible for inclusion in the NRHP, properties must be at least 50 years old, meet at least one of four criteria of significance, and retain sufficient historic integrity to convey that significance. The four criteria of significance are:

- Criterion A – be associated with events that have made a significant contribution to the broad patterns of our history
- Criterion B – be associated with the lives of persons significant in our past
- Criterion C – embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant distinguishable entity whose components may lack individual distinction
- Criterion D – have yielded, or may be likely to yield, information important in prehistory or history

Integrity is assessed in terms of location, design, workmanship, materials, setting, feeling, and association. The significance of a property may be at the local, state, or national level, depending on its historical associations. Typically, historic properties are at least 50 years of age, but more recent properties may be considered for listing if they are of exceptional significance.

American Indian Religious Freedom Act

The American Indian Religious Freedom Act established that it is the policy of the federal government to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions. If a place of religious importance to American Indians may be affected by a proposed federal project, the American Indian Religious Freedom Act promotes consultation with Indian religious practitioners, which may be coordinated with Section 106 consultation under NHPA (see above). Amendments to Section 101 of NHPA strengthened the interface between the two Acts by clarifying that:

- Properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion in the NRHP [16 U.S.C. § 470a(d)(6)(A)].
- In carrying out its responsibilities under Section 106, a federal agency shall consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to properties as described in subparagraph (A) [16 U.S.C. § 470a(d)(6)(B)].

National Register Bulletin #38

Amendments to NHPA in 1980 directed the Secretary of the Interior to study means of "preserving and conserving the intangible elements of our cultural heritage such as arts, skills, folklife, and folkways . . ." and to recommend ways to "preserve, conserve, and encourage the continuation of the diverse traditional prehistoric, historic, ethnic, and folk cultural traditions that underlie and are a living expression of our American heritage" (16 U.S.C. § 470a note). As an eventual response, federal guidelines were established (as published in National Register Bulletin #38 [Bulletin #38]) to define, document, and evaluate TCPs (Parker and King 1990). Bulletin #38 was intended to help determine whether properties thought to have traditional cultural importance would

How is NRHP eligibility determined?

The NHPA of 1966, as amended (16 U.S.C. § 470), requires federal agencies to take into account the effects of their undertakings on historic properties and afford the SHPO and other parties with a demonstrated interest a reasonable opportunity to comment on such undertakings. Regulations for Protection of Historic Properties (36 C.F.R. Part 800) implement Section 106 of the NHPA. These regulations define a process for the responsible federal agencies to consult with SHPO or the THPO, Native American groups, other interested parties, and, when necessary, the Advisory Council on Historic Preservation (ACHP) to ensure that historic properties are duly considered as federal projects are planned and implemented.

To be determined eligible for inclusion in the NRHP, properties must be important in American history, architecture, archaeology, engineering, or culture. They also must possess integrity of location, design, settings, materials, workmanship, feeling, and association, and meet at least one of four criteria listed on this page.

Properties may be of local, state, or national importance. Typically, historic properties are at least 50 years old, but may be younger if they are of exceptional importance.

be NRHP-eligible and to assist federal agencies in evaluating such properties.

A TCP is generally defined as a property eligible for inclusion in the NRHP "because of its association with cultural practices or beliefs of a living community that a) are rooted in that community's history, and b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1990). The guidelines in Bulletin #38 were appropriate for evaluating potential TCPs associated with the proposed action.

Identification of Cultural Resources

Previously Recorded Resources

A records search was performed in 2002 that covered a broad portion of the valley between the Sierra Estrella and SMPP. Over 300 previously recorded archaeological sites within or partly within the Study Area were identified from archaeological investigations conducted between 1955 and 2002. These sites were categorized as:

- prehistoric artifact scatters (166 sites)
- prehistoric habitations (45 sites)
- prehistoric villages (14 sites)
- prehistoric and historic canals (14 sites)
- historic trash dumps (13 sites)
- prehistoric rock piles, rings, and outlines (12 sites)
- prehistoric lithic scatters/quarries (4 sites)
- prehistoric mounds (9 sites)
- prehistoric petroglyphs (10 sites)
- historic structures/foundations (4 sites)
- historic roads (1 site)
- prehistoric trails (3 sites)
- historic mining operations (3 sites)
- unknown sites (no information available) (4 sites)

The identified sites were:

- listed in the NRHP (2 sites)
- determined to be NRHP-eligible (27 sites)
- determined to be potentially NRHP-eligible (122 sites)
- determined to be NRHP-ineligible (15 sites)
- not assessed for NRHP eligibility (136 sites)

Three years later, a supplemental records search was performed to address newly included areas of the Study Area along I-10 (Papago Freeway) and SR 101L (Agua Fria Freeway). The additional investigation identified 27 previously recorded prehistoric and historic archaeological sites, 5 historical-period linear sites (railroad lines, roadways, and canals), and 129 historic building properties. In addition, historical maps indicated that several prehistoric canal alignments had been documented in the Study Area. Of the archeological sites, 5 were considered NRHP-eligible, 5 were not eligible, 9 were not evaluated for eligibility, and the eligibilities of 8 were unknown because information was lacking. Historically documented prehistoric canals in the area were viewed as potentially eligible resources that should be investigated if encountered. The 5 historical-period linear sites were considered eligible. Of the 129 historic building properties, 25 were previously recommended as NRHP-eligible, 37 were recommended as not eligible, and 67 had not been evaluated.

Field Survey

After known sites were researched by records investigations, field surveys were conducted to identify historic properties that could be affected by the proposed action. In 2003 and 2004, the initial cultural resources survey for the project documented 19 archaeological sites and 191 isolated occurrences (Darling 2005). The survey resulted in the recording of 6 new archaeological sites and the expansion of the boundaries of 4 previously recorded sites. In addition, the conditions of 9 other previously recorded sites were updated, with no changes to their previously defined boundaries. The isolated occurrences included individual artifacts, features, and small groupings of artifacts that did not qualify as sites. Of the newly recorded or updated sites, 19 were determined NRHP-eligible and one of the sites was determined not eligible.

In 2005, 2006, and 2009, supplemental surveys were performed (Brodbeck and Pratt 2005; Brodbeck 2006a; Dorigo 2006; Fackler et al. 2009). The purposes of these surveys were to:

- evaluate the NRHP eligibility of properties with historic buildings that were not documented in earlier studies and, consequently, provide the information needed to determine whether they

The South Mountains as a Traditional Cultural Property

The South Mountains are highly valued and considered sacred by some Native American communities. The Community, which includes the Akimel O'odham (River People) and Pee Posh (Maricopa) tribes, and other Native American entities—including the Colorado River Indian Tribes and three O'odham groups: the Salt River Pima-Maricopa Indian Community, the Ak-Chin Community, and the Tohono O'odham Nation—consider the South Mountains to play a role in their cultures, identities, histories, and oral traditions. Because of their importance in the Community's history and cultural identity, the South Mountains are NRHP-eligible as a TCP under Criteria A and B.

View to southwest from the South Mountains toward the Community.

Through the course of preparing the FEIS, the Community has continuously expressed to ADOT its concerns about the roadway going through the South Mountains and the possible irreversible impacts on the South Mountains from the proposed action. In addition to a large portion of the South Mountains being protected as a city park, all of the mountain range and some of the surrounding landscape are also afforded protection under the provisions set forth in Section 4(f) as an NRHP-eligible TCP.

The South Mountains appear in the creation stories of the Akimel O'odham and Pee Posh tribes and, as such, are regarded as sacred. From the perspective of the Akimel O'odham and Pee Posh, the South Mountains are part of a continuum of life and not an individual entity that can be isolated and analyzed. The South Mountains TCP extends beyond SMPP. The South Mountains qualify as a Section 4(f) resource and are discussed in Chapter 5.

The South Mountains continue to be a focus for tribal tradition and ceremony and contain petroglyph sites, shrines, trails, named places in traditional stories, and traditional resources. The South Mountains also remain as a resource area for upland plants and animals used by Native Americans.

The portions of the South Mountains on Community land are the Main Ridge North and Main Ridge South, at the western end.

In addition to the mountains themselves, two specific areas (sites) in the Study Area were identified as contributing components of the TCP based on their own merit as historic properties. Both are considered NRHP-eligible under Criterion D.

Site AZ T:12:197 (ASM)[a] contains a trail segment, two rock features, and an artifact scatter. Although the site's age and function are unknown, its position on the landscape is unique and possibly associated with traditional religious and ceremonial activities associated with the South Mountains. Site AZ T:12:198 (ASM) has a collection of well-preserved prehistoric petroglyphs situated within the boundary of the South Mountains TCP. While the rock art is prehistoric in age, these sites continue to function in the living Akimel O'odham and Pee Posh communities and often serve as shrines or spiritual places. Both sites are eligible under Criterion D.

[a] Site naming conventions follow protocols prescribed by the Arizona State Museum (ASM).

The South Mountains as a historic resource

SMPP, which occupies much of the land area of the South Mountains and is NRHP-eligible, has played a key role in the development of the City of Phoenix's parks and recreation program. It is NRHP-eligible because of its rich history:

- **The park's origins began in 1924 when prominent local citizens, aided by then-Congressman Carl Hayden, started a process to obtain 13,000 acres from the federal government. The parkland was conveyed in 1927 by BLM to the City of Phoenix by a grant under the Recreation and Public Purposes Act.**
- **The National Park Service developed the original Master Plan for the park in 1934; this represented the largest municipal park planning effort in the United States.**
- **The development of the park from 1933 to 1942 was the direct result of President Franklin D. Roosevelt's New Deal programs, which provided relief from the Great Depression by employing the Civilian Conservation Corps (CCC).**
- **Today, the park retains many of its original CCC-constructed buildings, structures, and facilities, and it retains its master-planned layout and design.**

In 1989, the City of Phoenix listed SMPP in the City of Phoenix Historic Property Register as a Nonresidential Historic District. The City of Phoenix Historic Preservation Office is in the process of nominating SMPP for listing in the NRHP. SHPO has concurred that SMPP is eligible for the NRHP under Criteria A, B, C, and D for its numerous important historical associations.

qualified as Section 4(f) resources under the Department of Transportation Act [see Chapter 5, *Section 4(f) Evaluation*]

- ➤ survey additional alignment configurations introduced as part of the iterative EIS process
- ➤ survey agricultural fields that had been plowed since the original survey

Of the documented sites from the 2005 supplemental survey, one prehistoric site, six historic sites, and two historic linear sites—a railroad and a canal—were determined NRHP-eligible. As a result of the findings, the action alternatives were reconfigured to avoid the historic properties determined NRHP-eligible.

In 2006, two additional surveys were performed. These surveys assessed historic sites that had not been previously evaluated for NRHP eligibility and that had been included in the area of potential effects as a result of shifts in the action alternative alignments. The properties include SMPP, the Roosevelt Canal, and three farmhouses. SMPP was determined NRHP-eligible. The Roosevelt Canal was determined eligible with contributing and noncontributing components. The three farmhouses were determined not eligible.

In 2009, another supplemental survey and an additional records search were conducted to identify surveys conducted and sites recorded within 1 mile of the W59 and E1 Alternatives since the original records search. The supplemental survey documented nine isolated occurrences, but no new archaeological sites or historic properties.

A survey and records search of two additional areas within the Study Area occurred in September 2011. These efforts focused on areas where Western Area Power Administration (Western) towers and lines would be relocated to accommodate the proposed freeway. The surveys covered 101 acres and documented eight sites: six NRHP-eligible sites and two NRHP-ineligible sites. Three previously unrecorded sites were discovered.

NRHP-eligible and formerly eligible properties exist near Dobbins Road in Laveen near the W59 Alternative. The Hudson Farm district is eligible for listing in the NRHP under Criterion A for its association with Laveen's agricultural development. In addition, four structures—the two cement stave silos on the Hudson Farm, the dairy flat barn on the Hackin Farmstead/Dairy, and the dairy head-to-toe barn on the Tyson Farmstead/Barnes Dairy—are individually eligible under Criterion C for their design and construction (Solliday and Macnider 2012).

Although previously recommended as eligible for the NRHP (Brodbeck and Pratt 2005), the Dobbins Road Streetscape (6100 Block of West Dobbins Road) was reevaluated and determined to be not eligible because many components of the streetscape, including buildings, vegetation, and views of agricultural fields, have lost their historic character (Solliday and Macnider 2012). SHPO concurred with these eligibility recommendations on July 16, 2012.

Identification of Traditional Cultural Properties

A TCP evaluation within the proposed action's area of potential effects was conducted. Ten locations were identified by the Community as places of cultural importance that could qualify as NRHP-eligible TCPs. The NRHP eligibility of two of the properties was confirmed by FHWA through consultation with the Community. To be in full accordance with NHPA, all ten potential TCPs were evaluated for NRHP eligibility.

Traditional Cultural Properties

The initial field survey for the proposed action (Darling 2005) identified ten potential TCPs: the South Mountains, two prehistoric village sites, an active shrine site, two prehistoric petroglyph sites, and four prehistoric trail sites. As a result of TCP evaluations and consultations with the Community, five TCPs have been identified within the area of potential effects. The South Mountains were determined eligible for NRHP listing as a TCP under Criteria A and B. The two prehistoric villages, Villa Buena [AZ T:12:9 (ASM)] and Pueblo del Alamo [AZ T:12:52 (ASM)], were determined eligible for listing in the NRHP as TCPs under Criterion A and as archaeological sites under Criterion D. An active shrine site, AZ T:12:112 (ASM), was determined eligible as a TCP under Criterion A and as an archaeological site under Criterion D. One petroglyph site, AZ T:12:198 (ASM), was determined eligible as a TCP under Criterion A and as an archaeological site under Criterion D.

In addition, two of the ten potential TCPs identified by the initial field survey were found to be eligible for listing in the NRHP under Criterion A as contributors to the South Mountains TCP. These included a prehistoric trail site [AZ T:12:197 (ASM)] and a prehistoric petroglyph site [AZ T:12:198 (ASM)], both of which retained qualities that contributed to the NRHP eligibility of the South Mountains TCP.

Four sites identified as potential TCPs included three trail sites and one heavily altered rock art site. The trail sites— AZ T:12:201 (ASM), AZ T:12:207 (ASM), and AZ T:12:211 (ASM)—were determined not eligible for NRHP listing as TCPs but eligible under Criterion D as archaeological sites. The rock art site, AZ T:12:208 (ASM), was determined to be not eligible for NRHP listing as a TCP but eligible under Criterion D as an archaeological site.

ENVIRONMENTAL CONSEQUENCES

Prehistoric Site Impacts, Action Alternatives, Western and Eastern Sections

All action alternatives would affect archaeological resources. All but one of the archaeological sites are eligible for the NRHP under Criterion D. Table 4-45 presents the number and types of NRHP-eligible archaeological sites that would be affected by the action alternatives.

The action alternatives in the Western Section would affect artifact scatters, mostly visible in agricultural fields; the scatters likely represent the remains of prehistoric habitations and related agricultural activities. In contrast, the E1 (Preferred) Alternative would affect NRHP-eligible archaeological sites that are activity-specific sites, such as small artifact scatters, lithic quarries, and trails. The construction footprint would avoid a petroglyph site in the E1 Alternative corridor.

The W59 (Preferred) Alternative would affect the greatest number of sites in the Western Section, while

Table 4-45 Archaeological Resources Affected, Action Alternatives

Action Alternative[a]	Number of Sites Affected	Site Type	NRHP[b] Eligibility Criterion	Mitigation Required[c]
Western Section				
W59	5	2 village sites[d], 3 artifact scatters	D[e]	Yes
W71	4	1 village site[d], 3 artifact scatters		
W101 Western Option	3	1 village site[d], 2 artifact scatters		
W101 Central Option	2	1 village site[d], 1 artifact scatter		
W101 Eastern Option	2	1 village site[d], 1 artifact scatter		
Eastern Section				
E1	7	1 artifact scatter (limited activity site) 2 lithic quarry sites[f] 4 trail sites[g, h]	D	Yes

[a] Impacts associated with the No-Action Alternative are presented on page 4-158.
[b] National Register of Historic Places
[c] Mitigation requirements are presented beginning on page 4-158.
[d] Village sites are eligible for listing in the NRHP under Criterion A.
[e] a cultural resource or site having yielded, or one that may be likely to yield, information important in prehistory or history
[f] One lithic quarry site had petroglyphs destroyed by modern development.
[g] The ages of trail sites are unknown, but likely have historic and prehistoric associations.
[h] Some trails have associated artifacts and features.

the W101 Alternative and its Options would affect the fewest. When comparing impacts on archaeological sites, however, it is important to consider the types of sites being affected. Although the W101 Alternative would affect the fewest number of archaeological sites, the sites that would be affected include an artifact scatter of one extensive prehistoric Hohokam village. Similarly, the W71 Alternative would affect the same village site, and the W59 Alternative would affect two other prehistoric Hohokam village sites of similar extent. These sites have been identified through observations of surface artifacts, which may or may not be reliable indicators of buried cultural features. Without archaeological testing, the full extent, distribution, and condition of buried archaeological resources are unknown within and among action alternatives. To further clarify, the process of identifying sites through observations of surface artifacts to be documented through archaeological test excavations later in the process would not be atypical, but would represent the standard, accepted analytical progression.

Historic Site Impacts, Action Alternatives, Western and Eastern Sections

All of the Western Section action alternatives would cross the historic Southern Pacific Railroad and the Roosevelt Canal, which are NRHP-eligible; the segments of the Roosevelt Canal that would be crossed by the W101 Alternative and Options, however, are not eligible because the canal segments are modern realignments. The segments of the Roosevelt Canal that would be crossed by the W59 (Preferred) and W71 Alternatives are NRHP-eligible because they are well-preserved and represent the original design and construction.

As discussed in Chapter 3, *Alternatives*, the 62nd Avenue Option of the W59 Alternative was advanced for further study because this option would avoid historic properties (Hudson Farm district and the dairy barn on the Tyson Farmstead/Barnes Dairy) and would not conflict with City-approved zoning in Laveen Village. Therefore, the W59 Alternative would have no adverse effect on these resources. SHPO concurred with these findings of effect on September 14, 2012.

Although the E1 (Preferred) Alternative would cross SMPP, no features contributing to its historic significance would be affected by the proposed action (however, see the TCP discussion in the following section). Table 4-46 summarizes known historical sites that would be affected by the action alternatives.

Impacts on TCPs, Action Alternatives, Western and Eastern Sections

The Community has expressed concerns that the proposed action may interfere with the perpetuation of its cultural traditions and identity through the loss of spiritual and physical connections; loss of social memory; interference with cultural knowledge, creation stories, and song traditions; and damage to the knowledge that resides in Villa Buena and Pueblo del Alamo. To prevent adverse effects, the Community submitted a proposal to develop an enhancement and management plan for the Villa Buena and Pueblo del Alamo TCPs. These enhancement measures may include short-term (traditional religious activities, exhibits to increase awareness of losses and gains to culture, additional tribal consultation, and protection of sites of equivalent importance) and long-term (cultural preservation and education) programs. THPO concurred with this approach on October 22, 2012.

FHWA and ADOT have committed to implementing the TCP enhancement and management plan for these two sites. As a result, the W71 and W101 Alternatives in the Western Section would not adversely affect the NRHP-eligible TCP attributes of Villa Buena, while the W59 Alternative would not adversely affect the NRHP-eligible TCP attributes of Pueblo del Alamo. SHPO concurred with the effect determination on October 25, 2012.

In the Eastern Section, the E1 (Preferred) Alternative would adversely affect the South Mountains TCP. A second TCP, an active shrine, is located within the E1 Alternative footprint, but would be avoided by construction. The Community has concurred with proposed mitigation of direct and indirect adverse

What actions have been taken to reduce or avoid impacts on cultural resources?

The section, *Alternatives Development and Screening*, beginning on page 3-1, outlines the process undertaken to identify the range of action alternatives presented in detail in the FEIS. Through the screening process, some action alternatives were eliminated completely from the study because of the severity of impacts they would have caused on cultural resources. Design adjustments to the W59, W71, W101, and E1 Alternatives have been made to further reduce or avoid impacts on known cultural resources in the Study Area. Specific measures taken include:

- **The South Mountain Freeway, as proposed in 1988, would have resulted in a direct use of just over 40 acres of SMPP (ADOT 1988a). Using approximately the same alignment as planned in 1988, R/W needs of the proposed action through SMPP would result in an actual use of just under 31.3 acres; the design as planned in the FEIS would use approximately 9 acres less than what was planned in 1988 (see page 5-23).**
- **The alignment of the South Mountain Freeway, as planned in 1988, was located to avoid bisecting SMPP and to avoid the creation of remnant parcels of parkland. As such, the alignment was placed on the SMPP and Community boundary lines (see Figure 5-14, on page 5-23). The intent behind this determination has not changed with the proposed action.**
- **In the mid-1980s, as plans progressed to design and construct the South Mountain Freeway, ADOT purchased land adjacent to the SMPP boundary and turned it over to the City of Phoenix; the intent was to replace parkland that would be converted to the freeway use. The approximately 16-acre property is located on the western side of the SMPP boundary.**
- **The alignment options for the W59 Alternative were adjusted near Dobbins Road to avoid historic resources.**

Table 4-46 NRHP[a]-eligible Historical Sites (non-TCP[b]), Action Alternatives

Action Alternative[c]	Site	NRHP Eligibility Criterion	Status of Section 106 Consultation	Affected	Mitigation Required[d]
Western Section					
W59	Roosevelt Canal[e]	Criterion A	Ongoing	No	No
	Historic Southern Pacific Railroad[f]			No	No
W71	Roosevelt Canal			No	No
	Historic Southern Pacific Railroad			No	No
W101 Western Option	Historic Southern Pacific Railroad			No	No
W101 Central Option					
W101 Eastern Option					
Eastern Section					
E1	Phoenix South Mountain Park/Preserve	Criteria A, B, C, D	Ongoing	Yes	No[g]

[a] National Register of Historic Places
[b] traditional cultural property
[c] Impacts associated with the No-Action Alternative are presented on page 4-158.
[d] Mitigation requirements are presented beginning on page 4-158.
[e] The Roosevelt Canal has been recommended as NRHP-eligible for its associations with the development of historical irrigation districts in the lower Salt River and Buckeye valleys. A portion of the open canal would be routed beneath the W59 and W71 Alternatives. The freeway would be constructed on a bridge to eliminate potential impacts.
[f] The Wellton-Phoenix-Eloy main line of the Arizona Eastern Railroad (which became part of what is most generally known as the historic Southern Pacific Railroad and is now part of the Union Pacific Railroad) was recommended as NRHP-eligible for its association with the development of Arizona's railroad network. The railroad has been maintained and upgraded over the years and remains an important component of Arizona's transportation network. All action alternatives in the Western Section would cross the railroad on a grade-separated structure. Given that the railroad's setting has been highly modified by modern development, it is expected that a bridge crossing would not affect the qualities of the railroad that contribute to its eligibility to the NRHP. Therefore, no impacts on the railroad would occur.
[g] The E1 (Preferred) Alternative would not significantly adversely affect qualities of SMPP that qualify it for listing in the NRHP.

impacts on the South Mountains TCP. In a letter from the Lt. Governor to the Director at FHWA dated June 23, 2010, the Community submitted a proposal for the "Evaluation of Traditional Cultural Property and Adverse Effects of Transportation Corridor Development posed by the proposed construction of the current Pecos Alignment of the South Mountain Freeway."

This proposal addresses several key points related to the proposed freeway:

- "… the current proposal only addresses partial measures for the mitigation of adverse effects posed by the Pecos alignment to Traditional Cultural Property (TCP) including individual sites and the mountain (*Muhadagi Doag* – South Mountain) and may be used in the preparation and finalization of the Environmental Impact Statement (EIS)."
- "The attached proposal also acknowledges the engineering solutions provided by ADOT in the form of overpasses for the avoidance and protection of sensitive cultural sites as acceptable concepts and that implementation of their design and construction will require further consultation in the event these go forward. This includes especially the implementation of proposed massive cuts through the western ridges of *Muhadagi Doag* and earthworks required for construction of the Pecos alignment, which will significantly impact the mountain and the surrounding cultural landscape."
- "… this proposal identifies the important and significant overlap of wildlife and culture corridors and the significance of all plants and animals in the traditional culture of the Akimel O'odham and Pee Posh of this Community."

Consultation with THPO and other tribes regarding appropriate mitigation of the South Mountains TCP is ongoing (Table 4-47 documents past efforts). SHPO concurred with TCP eligibility, potential project effects, and proposed TCP mitigation on May 15, 2012.

The E1 Alternative would have an adverse effect on the South Mountains TCP. The conversion and permanent loss of part of the mountains to a transportation use by the action alternative would be compounded by the following related Community-expressed concerns focused on impacts on the Community's history, culture, traditions, and its ability to maintain and sustain its cultural identity.

- The proposed action's cuts through the South Mountains would remove two archaeological sites identified as contributing components of the South Mountains TCP, based on their own merits as historical properties (considered NRHP-eligible under Criteria A and D).
- The proposed action's cuts through the South Mountains would result in the modification of the spiritual landscape of Native peoples.
- The E1 Alternative location between the Community and the South Mountains would alter, but not prevent, access by Native American groups to culturally important places.
- The location and operation of the E1 Alternative would interfere with ceremonial practices and religious activities of some Native American groups [the sections, *Public Parkland Resources (SMPP) Associated with the South Mountains*, *NRHP-Eligible Historic Resources (SMPP) Associated with the South Mountains,* and *The South Mountains (Muhadagi Doag) as a Traditional Cultural Property*, beginning on pages 5-14, 5-25, and 5-26, respectively, further elaborate the extent of potential impacts on traditions, cultural identity, landscape alteration, access, and habitat connectivity important to religious practices].

No-Action Alternative

The No-Action Alternative would not affect archaeological and cultural resources in the Study Area. Cultural resources in protected areas, such as SMPP, would not be affected by construction activities associated with the proposed action.

Because of the growth of the Phoenix metropolitan area as it is currently planned and as it is projected to occur, cultural resource properties and sites in areas zoned for development may eventually be disturbed. In most instances, federally required surveys to locate and assess cultural resources sites would not be required and would not occur. However, City of Phoenix ordinances do require developers to perform cultural resources studies to acquire building permits. The potential does exist that, in some instances, important sites would not be discovered and mitigation, even in the form of documentation, would not occur. Further, the No-Action

Table 4-47 Record of Section 106 Consultation

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
8/20/03 (FHWA[a])	• To initiate Section 106[b] consultations • To request concurrence that consultations continue to address eligibility, area of potential effects, project scope and effect, and the development of a PA[d] as alternatives alignments are developed • To provide an opportunity to review the initial records search report of the overall Study Area (Burden 2002)	Arizona State Land Department	—[c]	No response	—	—	—	—
		Bureau of Indian Affairs	10/27/03	Concurred	—	—	—	—
		Bureau of Land Management	9/22/03	Concurred	—	—	—	—
		Bureau of Reclamation	9/11/03	Concurred	—	—	—	—
		City of Avondale	—	No response	—	—	—	—
		City of Chandler	—	No response	—	—	—	—
		City of Phoenix – City Archaeologist	9/17/03	Concurred, with comments	—	—	—	—
		City of Phoenix –Historic Preservation Office	9/8/03	Noted that records search report did not address some known historic resources	—	—	—	—
		City of Tolleson	—	No response	—	—	—	—
		Salt River Project	11/10/03	Concurred	—	—	—	—
		State Historic Preservation Office	9/19/03	Concurred	—	—	—	—
		Ak-Chin Indian Community	—	No response	—	—	—	—
		Gila River Indian Community	—	No response	—	—	—	—
		Hopi Tribe	9/10/03	Concurred	—	—	—	—
		Salt River Pima-Maricopa Indian Community	—	No response	—	—	—	—
		Tohono O'odham Nation	—	No response	—	—	—	—
		Yavapai-Apache Nation	—	No response	—	—	—	—
		Yavapai-Prescott Indian Tribe	9/10/03	Deferred participation to the Southern tribes	—	—	—	—
12/9/03 (ADOT[e])	• To request concurrence on draft PA	Arizona State Land Department	—	No response	—	—	—	—
		Bureau of Land Management	12/30/03	Concurred	—	—	—	—
		Bureau of Reclamation	12/18/03	Concurred, with comments	—	—	—	—
		City of Phoenix – City Archaeologist	12/17/03	Concurred	—	—	—	—
		City of Phoenix – Historic Preservation Office	—	No response	—	—	—	—
		Salt River Project	4/1/04	Concurred	—	—	—	—
		State Historic Preservation Office	1/12/04	Concurred	—	—	—	—

Note: The correspondence listed in this table can be found in Appendix 2-1.

[a] Federal Highway Administration [b] part of the National Historic Preservation Act [c] not applicable [d] programmatic agreement [e] Arizona Department of Transportation

(continued on next page)

Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
12/9/03 (ADOT) (continued)	• To request concurrence on draft PA	Gila River Indian Community	—	No response	—	—	—	—
		Hopi Tribe	12/11/03	Deferred participation in PA to Gila River Indian Community; requested continued participation in Section 106 consultations	—	—	—	—
3/4/04 (FHWA)	• To notify the ACHP[f] about the project and determine Council participation	ACHP	3/30/04	Declined participation; encouraged the development of a PA without ACHP involvement	—	—	—	—
7/1/05 (ADOT)	• To request concurrence on the adequacy of the field survey[g] report (Darling 2005) • To request concurrence on second draft PA	Arizona State Land Department	—	No response	—	—	—	—
		Bureau of Indian Affairs	8/3/05	Declined participation in PA; concurred verbally	—	—	—	—
			8/11/05	Written response received	—	—	—	—
		Bureau of Land Management	7/26/05	Concurred	—	—	—	—
		Bureau of Reclamation	7/12/05	Concurred	—	—	—	—
		City of Phoenix – City Archaeologist	7/18/05	Concurred, with comments	—	—	—	—
		Salt River Project	8/8/05	Concurred	—	—	—	—
		State Historic Preservation Office	7/11/05	SHPO[h] did not concur; comments on the eligibility of the isolated occurrences and historic canals, and on the draft PA	1/12/06	ADOT requested concurrence on eligibility recommendations for the isolated occurrences and prehistoric sites for the initial field survey report (Darling 2005); noted that the isolated occurrences would be considered in the overall treatment plan.	1/23/06	SHPO concurred that the 19 prehistoric sites are eligible individually under Criterion D,[i] but noted that a broader context is needed to understand the significance of the Study Area and surrounding setting.
7/7/05 (FHWA)	• To request concurrence on the adequacy of the field survey report (Darling 2005) • To request information regarding TCP[j] concerns • To request adequacy of draft PA • To request participation in the PA	Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Indian Tribe	—	No response	—	—	—	—
		Cocopah Indian Tribe	—	No response	—	—	—	—
		Colorado River Indian Tribes	—	No response	—	—	—	—
		Fort McDowell Yavapai Nation	8/5/05	Concurred	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—
		Fort Yuma-Quechan Tribe	—	No response	—	—	—	—
		Gila River Indian Community	9/30/05	Identified South Mountains, Villa Buena, and Pueblo del Alamo as TCPs	11/22/2005	Acknowledged South Mountains TCP; requested boundary for South Mountains TCP and input on appropriateness of TCP evaluation for Villa Buena and Pueblo del Alamo	—	—

[f] Advisory Council on Historic Preservation [g] ground (field) survey for cultural resources [h] State Historic Preservation Office [i] see page 4-140 for criterion definition [j] traditional cultural property

(continued on next page)

Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
7/7/05 (FHWA) (continued)	• To request concurrence on the adequacy of the field survey report (Darling 2005) • To request information regarding TCP concerns • To request adequacy of draft PA • To request participation in the PA	Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	—	No response	—	—	—	—
		Hualapai Tribe	—	No response	—	—	—	—
		Kaibab-Band of Paiute Indians	—	No response	—	—	—	—
		Navajo Nation	—	No response	—	—	—	—
		Pascua Yaqui Tribe	—	No response	—	—	—	—
		Pueblo of Zuni	7/12/05	Concurred	—	—	—	—
		Salt River Pima-Maricopa Indian Community	—	No response	—	—	—	—
		San Carlos Apache Nation	—	No response	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Tohono O'odham Nation	—	No response	—	—	—	—
		Tonto Apache Tribe	—	No response	—	—	—	—
		White Mountain Apache Tribe	—	No response	—	—	—	—
		Yavapai-Apache Nation	—	No response	—	—	—	—
		Yavapai-Prescott Indian Tribe	7/22/05	Deferred participation to Southern Tribes	—	—	—	—
8/3/05 (ADOT)	• To request concurrence of adequacy of draft PA • To request participation in final PA	City of Avondale	—	No response	—	—	—	—
		City of Chandler	—	No response	—	—	—	—
		City of Glendale	—	No response	—	—	—	—
		City of Tolleson	—	No response	—	—	—	—
8/17/05 (ADOT)	• To request participation in final PA and in discussions regarding effects on TCPs	Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Indian Tribe	—	No response	—	—	—	—
		Cocopah Indian Tribe	—	No response	—	—	—	—
		Colorado River Indian Tribes	—	No response	—	—	—	—
		Fort McDowell Yavapai Nation	—	No response	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—
		Fort Yuma-Quechan Tribe	—	No response	—	—	—	—
		Gila River Indian Community	—	No response	—	—	—	—
		Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	—	No response	—	—	—	—
		Hualapai Tribe	—	No response	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
8/17/05 (ADOT) (continued)	• To request participation in final PA and in discussions regarding effects on TCPs	Kaibab-Band of Paiute Indians	—	No response	—	—	—	—
		Navajo Nation	—	No response	—	—	—	—
		Pascua-Yaqui Nation	—	No response	—	—	—	—
		Salt River Pima-Maricopa Indian Community	10/2/05	Concurred (Concurring Party)	—	—	—	—
		San Carlos Apache Nation	—	No response	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Tohono O'odham Nation	11/8/05	Concurred (Concurring Party)	—	—	—	—
		Tonto-Apache Tribe	—	No response	—	—	—	—
		White Mountain Apache Tribe	—	No response	—	—	—	—
		Yavapai-Apache Nation	—	No response	—	—	—	—
8/31/05 (ADOT)	• To request concurrence on adequacy of draft PA • To request participation in final PA	Flood Control District of Maricopa County	—	No response	—	—	—	—
		Maricopa County Department of Transportation	9/20/05	Concurred	—	—	—	—
		Roosevelt Irrigation District	—	No response	—	—	—	—
8/31/05 (ADOT)	• To request concurrence on adequacy and eligibility recommendations of the addendum records search and field survey reports (Brodbeck and Touchin 2005; Brodbeck and Pratt 2005)	Arizona State Land Department	—	No response	—	—	—	—
		Bureau of Land Management	—	No response	—	—	—	—
		Bureau of Reclamation	9/19/05	Concurred	—	—	—	—
		City of Phoenix – City Archaeologist	11/1/05	Concurred, with comments	—	—	—	—
		City of Phoenix – Historic Preservation Office	—	No response	—	—	—	—
		Salt River Project	9/13/05	Concurred, with comments (dated 9/19/05)	—	—	—	—
		State Historic Preservation Office	9/19/05	SHPO did not concur; requested revisions	9/29/05	ADOT requested concurrence on the eligibility recommendations in the addendum records search and field survey reports (Brodbeck and Touchin 2005; Brodbeck and Pratt 2005); letter not in file	10/3/05	SHPO concurred with eligibility recommendations
9/27/05 (FHWA)	• To notify ACHP of revised PA	ACHP	12/27/05	ACHP declined participation	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
9/29/05 (FHWA) (continued)	• To request comments on draft PA by 10/3/05 • To request participation in final PA • To request information on TCP concerns • To provide meeting minutes from TCP meeting held in Sacaton on September 20, 2005	Gila River Indian Community	–	No direct response; see letter from the Gila River Indian Community dated September 30, 2005	–	–	–	–
11/30/05 (FHWA)	• To request participation in PA	Gila River Indian Community	–	No response	–	–	–	–
3/7/06 (FHWA)	• To request concurrence on adequacy of technical reports and eligibility recommendations (Brodbeck and Pratt 2005; Brodbeck and Touchin 2005; Burden 2002; Darling 2005) • To request concurrence on adequacy of draft PA • To request participation in the PA	U.S. Army Corps of Engineers	–	No response	–	–	–	–
6/26/06 (FHWA)	• To request concurrence on the adequacy of the second addendum cultural resources report and eligibility recommendations (Brodbeck 2006a) • To request concerns regarding TCPs (tribes only)	Arizona State Land Department	–	No response	–	–	–	–
		Bureau of Indian Affairs	–	No response	–	–	–	–
		Bureau of Land Management	–	No response	–	–	–	–
		Bureau of Reclamation	8/1/06	Concurred	–	–	–	–
		City of Avondale	7/25/06	Concurred	–	–	–	–
		City of Chandler	7/3/06	Concurred	–	–	–	–
		City of Glendale	–	No response	–	–	–	–
		City of Phoenix – City Archaeologist	7/5/06	Concurred	–	–	–	–
		City of Phoenix – Historic Preservation Officer	8/16/06	Concurred	–	–	–	–
		City of Tolleson	–	No response	–	–	–	–
		Flood Control District of Maricopa County	7/6/06	Concurred	–	–	–	–
		Maricopa County Department of Transportation	7/5/06	Concurred	–	–	–	–

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
6/26/06 (FHWA) (continued)	• To request concurrence on the adequacy of the second addendum cultural resources report and eligibility recommendations (Brodbeck 2006a) • To request concerns regarding TCPs (tribes only)	Roosevelt Irrigation District	—	No response	—	—	—	—
		Salt River Project	7/7/06	Concurred	—	—	—	—
		State Historic Preservation Office	7/19/06	Concurred; with comments on eligibility of SMPP[k]	—	—	—	—
		U.S. Army Corps of Engineers	—	No response	—	—	—	—
		Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Indian Tribe	—	No response	—	—	—	—
		Cocopah Indian Tribe	—	No response	—	—	—	—
		Colorado River Indian Tribes	7/6/06	Notified ADOT by phone call that South Mountains are a TCP for the Colorado River Indian Tribes.	7/6/06	During the same phone call, ADOT requested written response from Colorado River Indian Tribes regarding the TCP concerns.	No response	—
		Fort McDowell Yavapai Nation	—	No response	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—
		Fort Yuma-Quechan Tribe	—	No response	—	—	—	—
		Gila River Indian Community	—	No response	—	—	—	—
		Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	7/3/06	Concurred	—	—	—	—
		Kaibab-Band of Paiute Indians	—	No response	—	—	—	—
		Navajo Nation	—	No response	—	—	—	—
		Pascua Yaqui Tribe	8/1/06	No concerns with project (e-mail)	—	—	—	—
		Pueblo of Zuni	—	No response	—	—	—	—
		Salt River Pima-Maricopa Indian Community	—	No response	—	—	—	—
		San Carlos Apache Nation	7/17/06	Concurred; no TCP concerns	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Tohono O'odham Nation	—	No response	—	—	—	—
		Tonto Apache Tribe	—	No response	—	—	—	—
		White Mountain Apache Tribe	7/7/06	No TCP concerns	—	—	—	—
		Yavapai-Apache Nation	—	No response	—	—	—	—
		Yavapai-Prescott Indian Tribe	8/14/06	Concurred; no TCP concerns	—	—	—	—

[k] South Mountain Park/Preserve

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
6/28/06 (FHWA)	• To request concurrence on the adequacy of the TCP report and eligibility recommendations (Brodbeck 2006b)	Gila River Indian Community	9/25/06; 12/19/06	Confirmed receipt of report and notified FHWA that a response was pending review with the Gila River Indian Community's Cultural Resource Standing Committee; provided comments on the report and requested revisions; concurred with some TCP eligibility recommendations	—	—	—	—
		State Historic Preservation Office	8/1/06	Did not concur; further response contingent on Gila River Indian Community response	—	—	—	—
12/11/06 (FHWA)	• To request signature on final PA	Arizona State Land Department	—	No response	—	—	—	—
		Bureau of Land Management	—	No response	—	—	—	—
		Bureau of Reclamation	—	No response	—	—	—	—
		City of Avondale	—	No response	—	—	—	—
		City of Chandler	2/22/07	Declined signing the PA	—	—	—	—
		City of Glendale	—	No response	—	—	—	—
		City of Phoenix–City Archaeologist	—	No response	—	—	—	—
		City of Phoenix–Historic Preservation Officer	1/8/07	Signed PA	—	—	—	—
		City of Tolleson	—	No response	—	—	—	—
		Flood Control District of Maricopa County	1/30/07	Signed PA; no cover letter	—	—	—	—
		Maricopa County Department of Transportation	1/16/07	Signed PA; no cover letter	—	—	—	—
		Roosevelt Irrigation District	—	No response	—	—	—	—
		Salt River Project	1/15/07	Signed PA; cover letter dated 1/16/07	—	—	—	—
		U.S. Army Corps of Engineers	—	No response	—	—	—	—
		Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Tribe	—	No response	—	—	—	—
		Cocopah Tribe	—	No response	—	—	—	—
		Colorado River Indian Tribe	—	No response	—	—	—	—
		Fort McDowell Yavapai Nation	1/11/07	Signed PA; cover letter dated 1/17/07	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
12/11/06 (FHWA) (continued)	• To request signature on final PA	Fort Yuma-Quechan Tribe	—	No response	—	—	—	—
		Gila River Indian Community	—	No response	—	—	—	—
		Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	—	No response	—	—	—	—
		Hualapai Tribe	—	No response	—	—	—	—
		Kaibab-Paiute Tribe	—	No response	—	—	—	—
		Navajo Nation	—	No response	—	—	—	—
		Pascua Yaqui Tribe	—	No response	—	—	—	—
		Pueblo of Zuni	—	No response	—	—	—	—
		Salt River Pima-Maricopa Indian Community	—	No response	—	—	—	—
		San Carlos Apache Tribe	—	No response	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Tohono O'odham Nation	—	No response	—	—	—	—
		Tonto Apache Tribe	2/3/07	Signed PA; no cover letter	—	—	—	—
		White Mountain Apache Tribe	—	No response	—	—	—	—
		Yavapai-Apache Nation	1/3/07	Signed PA; no cover letter	—	—	—	—
12/20/06 (FHWA)	• To request signature on final PA	Arizona State Museum	1/10/07	Signed PA	—	—	—	—
		State Historic Preservation Office	12/28/06	Signed PA	—	—	—	—
1/18/07 (FHWA)	• To request agreement for disclosing the location of AZ T:12:112 (ASM) to pertinent project team members	Gila River Indian Community	—	No response	—	—	—	—
5/15/07 (ADOT)	• To request concurrence on adequacy of the Jackson Farmstead evaluation report and eligibility recommendation	City of Phoenix–Historic Preservation Officer	—	No response	—	—	—	—
		State Historic Preservation Office	5/31/07	Concurred	—	—	—	—
5/24/07 (FHWA)	• Sent ACHP copy of final PA [36 C.F.R.[1] § 800.6(b)(iv)]	ACHP	—	No response required	—	—	—	—
6/13/07 (FHWA)	• To request concurrence on TCP boundary revision • To request agreement to disclose the location of AZ T:12:112 (ASM) to pertinent team members • To request meeting on cultural resources issues	Gila River Indian Community	7/2/07	Requested additional consultation on revised TCP report prior to its submission for NRHP determination and agreed that a meeting to discuss AZ T:12:112 (ASM) was needed; suggestion was made to include SHPO	—	—	—	—

[1] Code of Federal Regulations

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
4/22/08 (FHWA)	• To request meeting to discuss options for minimizing harm to sites AZ T:12:112 (ASM) and AZ T:12:198 (ASM) • To request a proposal for a study of Muhadagi Doag (South Mountains) TCP and a meeting to discuss avoidance measures	Gila River Indian Community	11/18/08	Provided a draft scope of work for a TCP evaluation for the traditional uses and significance of Muhadagi Doag (South Mountain)	1/13/09 and 4/28/10	FHWA provided additional information and clarification on the requested scope of work for the TCP evaluation. FHWA sent a follow-up letter requesting any comments on the Muhadagi Doag TCP proposal.	6/23/10	Provided a revised scope of work, which would define the cultural significance of the TCP and serve as partial mitigation for adverse effects that would result from the project
9/13/10	• Meeting to discuss cultural resources studies for the South Mountain EIS	ADOT, Gila River Indian Community, Cultural Resource Management Program	–	–	–	–	–	–
9/16/10 (FHWA)	• To request signature on the PA	Western Area Power Administration	10/18/10	Signed PA, cover letter dated 10/25/10	–	–	–	–
10/19/10	• Meeting to discuss cultural resource avoidance and the results of cultural resources surveys	ADOT, Gila River Indian Community, Cultural Resource Management Program	–	–	–	–	–	–
2/1/11 (FHWA)	• To request concurrence on approach for the mitigation of effects on historic properties near the W59 Alternative and Dobbins Road	State Historic Preservation Office	2/4/11	Concurred	–	–	–	–
2/7/11 (FHWA)	• To request concurrence on the adequacy of the revised TCP report NRHP-eligibilty recommendations	Gila River Indian Community	8/17/11	Provided comments; did not concur	–	–	–	–
4/14/11	• Meeting to discuss cultural resources issues and the Section 106 consultation process	FHWA, ADOT, Gila River Indian Community, Cultural Resource Management Program, Tribal Historic Preservation Officer	–	–	–	–	–	–
8/8/11 (FHWA)	• To request concurrence on determination of project effects and adequacy of the field survey report for geotechnical work at the 59th Avenue railroad crossing	State Historic Preservation Office	8/11/11	Concurred	–	–	–	–
		Union Pacific Railroad	–	No response	–	–	–	–
10/31/11 (FHWA)	• To request signature on the PA	Bureau of Indian Affairs	–	No response	–	–	–	–
1/23/12 (FHWA)	• To request signature on the PA	Bureau of Indian Affairs	–	No response	–	–	–	–

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
4/24/12 (FHWA)	• To request concurrence on TCP NRHP eligibility, adequacy of draft TCP mitigation plans, and Section 4(f) determinations	State Historic Preservation Office	5/15/12	Concurred with comments	—	—	—	—
		Gila River Indian Community	7/3/12	Concurred	—	—	—	—
6/11/12	• Meeting to discuss Section 106 consultations for TCPs	FHWA, ADOT, Gila River Indian Community	—	—	—	—	—	—
7/11/12 (FHWA)	• To request concurrence on reassessment of eligibility of resources near Dobbins Road	Arizona State Land Department	—	No response	—	—	—	—
		Bureau of Land Management	—	No response	—	—	—	—
		Bureau of Reclamation	7/25/12	Concurred	—	—	—	—
		City of Phoenix-Historic Preservation Office	7/18/12	Concurred	—	—	—	—
		City of Phoenix-Pueblo Grande Museum	7/17/12	Concurred	—	—	—	—
		Salt River Project	7/13/12	Concurred	—	—	—	—
		State Historic Preservation Office	7/16/12	Concurred	—	—	—	—
8/8/12 (FHWA)	• To request concurrence on eligibility and project effects on resources near Chandler Boulevard extension	Arizona State Land Department	8/14/12	Concurred	—	—	—	—
		Arizona State Museum	9/11/12	Concurred	—	—	—	—
		Bureau of Indian Affairs	9/21/12	Concurred	—	—	—	—
		Bureau of Land Management	—	No response	—	—	—	—
		Bureau of Reclamation	8/13/12	Acknowledged receipt of consultation letter	—	—	—	—
		City of Avondale	—	No response	—	—	—	—
		City of Chandler	9/10/12	Concurred	—	—	—	—
		City of Glendale	8/13/12	Concurred	—	—	—	—
		City of Phoenix-Historic Preservation Officer	8/29/12	Concurred	—	—	—	—
		City of Phoenix-Pueblo Grande Museum	9/26/12	Concurred			—	—
		City of Tolleson	—	No response	—	—	—	—
		Flood Control District of Maricopa County	8/20/12	Concurred	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
8/8/12 (FHWA) (continued)	• To request concurrence on eligibility and project effects on resources near Chandler Boulevard extension	Maricopa County Department of Transportation	—	No response	—	—	—	—
		Salt River Project	8/24/12	Concurred	—	—	—	—
		State Historic Preservation Office	8/13/12	Deferred response until Gila River Indian Community response	10/11/12	Provided Gila River Indian Community response	10/17/12	Concurred
		U.S. Army Corps of Engineers	—	No response	—	—	—	—
		Western Area Power Administration	—	No response	—	—	—	—
		Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Indian Tribe	—	No response	—	—	—	—
		Cocopah Indian Tribe	8/27/12	Concurred	—	—	—	—
		Colorado River Indian Tribes	—	No response	—	—	—	—
		Fort McDowell Yavapai Nation	8/21/12	Concurred	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—
		Fort Yuma-Quechan Tribe	—	No response	—	—	—	—
		Gila River Indian Community	9/10/12	Concurred; recommended site visit	—	—	—	—
		Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	8/14/12	Concurred	—	—	—	—
		Hualapai Tribe	—	No response	—	—	—	—
		Kaibab-Band of Paiute Indians	—	No response	—	—	—	—
		Navajo Nation	—	No response	—	—	—	—
		Pascua Yaqui Tribe	—	No response	—	—	—	—
		Pueblo of Zuni	—	No response	—	—	—	—
		Salt River Pima-Maricopa Indian Community	8/14/12	Deferred to Gila River Indian Community	—	—	—	—
		San Carlos Apache Nation	—	No response	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Tohono O'odham Nation	—	No response	—	—	—	—
		Tonto Apache Tribe	8/14/12	Concurred	—	—	—	—
		White Mountain Apache Tribe	8/17/12	Concurred	—	—	—	—
		Yavapai-Apache Nation	—	No response	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
9/6/12 (FHWA)	• To request concurrence on project effects to resources near Dobbins Road	Arizona State Land Department	9/20/12	Concurred	—	—	—	—
		Bureau of Land Management	—	No response	—	—	—	—
		Bureau of Reclamation	—	No response	—	—	—	—
		City of Phoenix-Historic Preservation Office	—	No response	—	—	—	—
		City of Phoenix-Pueblo Grande Museum	9/27/12	Concurred	—	—	—	—
		Salt River Project	9/24/12	Concurred	—	—	—	—
		State Historic Preservation Office	9/14/12	Concurred	—	—	—	—
9/26/12 (FHWA)	• To request concurrence on the adequacy of the TCP Enhancement Plan for the Pueblo del Alamo and Villa Buena TCPs • To request concurrence on a finding of "no adverse effect" for the Pueblo del Alamo and Villa Buena TCPs	Gila River Indian Community	10/22/12	Concurred	—	—	—	—
10/23/12 (FHWA)	• To request concurrence on a finding of "no adverse effect" for the Pueblo del Alamo and Villa Buena TCPs and Section 4(f) determination	State Historic Preservation Office	10/25/12	Concurred	—	—	—	—
10/31/12 (FHWA)	• To request concurrence with adequacy of the field survey report for the Western Area Power Administration power line shifts • To request concurrence with a finding of "adverse effect" for Pueblo del Alamo under Criterion D as an archaeological site as it pertains to the Western Area Power Administration power line shifts • To request concurrence with a finding of "no adverse effect" for Pueblo del Alamo as a TCP under Criterion A as it pertains to the Western Area Power Administration power line shifts	Gila River Indian Community	Response pending	—	—	—	—	—
		State Historic Preservation Office	11/5/12	Concurred	—	—	—	—
		Western Area Power Administration	11/20/12	Concurred	—	—	—	—

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Table 4-47 Record of Section 106 Consultation (continued)

Date Sent (from)	Purpose of Consultation	Consulting Parties	Date Responded	Response	Reply Date	Response	Response Date	Response
1/31/13	• To request concurrence on the adequacy of the TCP technical summary report • To request concurrence on the TCP NRHP eligibility recommendations • To request concurrence on the finding of project effect for TCPs • To request concurrence on the management recommendations for the treatment of TCP	Bureau of Indian Affairs	2/19/13	Concurred	—	—	—	—
		City of Phoenix	2/20/13	Concurred	—	—	—	—
		Ak-Chin Indian Community	—	No response	—	—	—	—
		Chemehuevi Tribe	—	No response	—	—	—	—
		Cocopah Tribe	2/11/13	Concurred	—	—	—	—
		Colorado River Indian Tribes	2/25/13	Concurred	—	—	—	—
		Fort McDowell Yavapai Nation	2/4/13	Concurred	—	—	—	—
		Fort Mojave Indian Tribe	—	No response	—	—	—	—
		Havasupai Tribe	—	No response	—	—	—	—
		Hopi Tribe	2/6/13	Concurred	—	—	—	—
		Hualapai Tribe	—	No response	—	—	—	—
		Kaibab-Paiute Tribe	—	No response	—	—	—	—
		Navajo Nation	3/20/13	Concurred	—	—	—	—
		Pascua Yaqui Tribe	—	No response	—	—	—	—
		Quechen Indian Tribe	—	No response	—	—	—	—
		San Carlos Apache Tribe	2/5/13	Concurred	—	—	—	—
		San Juan Southern Paiute	—	No response	—	—	—	—
		Salt River Pima-Maricopa Indian Community	—	No response	—	—	—	—
		Tonto Apache Tribe	2/6/13	Concurred	—	—	—	—
		Tohono O'odham	3/13/13	Concurred	—	—	—	—
		White Mountain Apache Tribe	2/21/13	Concurred	—	—	—	—
		Yavapai-Apache Nation			—	—	—	—
		Pueblo of Zuni			—	—	—	—

Alternative would not preclude the proposal and possible implementation of a project similar to the proposed action from occurring in the future.

MITIGATION

ADOT EPG Responsibilities

Specific mitigation strategies would vary depending on the types of cultural resources that would be affected. Strategies to mitigate adverse effects to the prehistoric sites eligible for NRHP listing under Criterion D, including Villa Buena and Pueblo del Alamo, would include:

- A preconstruction testing plan would be developed and implemented for the sites by ADOT EPG's Historic Preservation Team. The testing plan would define locations of test excavations within sites to determine whether important archaeological deposits exist within the area of potential effects. The Historic Preservation Team would consult with SHPO and other consulting parties as required. Depending on the results of the testing program, follow-up data recovery excavations might also be required.
- A burial agreement with the Arizona State Museum (ASM) and concerned Native American tribes would be developed to outline procedures for proper removal, treatment, and reburial of any human remains and associated funerary objects that might be encountered.

Impacts on the Roosevelt Canal and historic Southern Pacific Railroad would be avoided through the use of bridges to span the resources.

Because effects of the proposed action on NRHP-eligible properties are not and would not be always fully known, ADOT—on behalf of FHWA and in conjunction with tribal and local authorities, Western, and the U.S. Bureau of Indian Affairs (BIA)—developed a Programmatic Agreement (PA) for the proposed action. A PA is a document that spells out the terms of a formal, legally binding agreement between lead agencies and other interested parties for the proper treatment and management of affected cultural resources.

Bulletin #38 - Traditional Cultural Properties

For the proposed action, several sites were evaluated for eligibility as TCPs, consistent with Bulletin #38 (Parker and King 1990; see page 4-141). The evaluation was conducted to:

- Ensure that the entity under consideration is a "property" – The entity evaluated must be a tangible property, that is, "a district, site, building, structure, or object." The NRHP defines a "site" as "the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of the value of any existing structure" (Parker and King 1990).
- Consider the property's integrity – To be eligible for inclusion in the NRHP, a property must have "integrity of location, design, setting, materials, workmanship, feeling, and association" (36 C.F.R. Part 60.4). In the case of a TCP, the National Park Service (NPS) poses two fundamental questions to ask about integrity (Parker and King 1990): 1) does the property have an integral relationship to traditional cultural practices or beliefs? and 2) is the condition of the property such that the relevant relationships survive?
- Apply the NRHP criteria outlined in National Register Bulletin #15, *How to Apply the National Register Criteria for Evaluation* (NPS 1990) – The entity is to be evaluated against the four basic NRHP criteria set forth in the NRHP-published regulations (36 C.F.R. Part 60.4). If the property meets one or more of the criteria, it may be eligible (Parker and King 1990). These criteria were discussed earlier under NHPA.
- Determine whether any of the NRHP criteria considerations (36 C.F.R. Part 60.4) make the property ineligible (NPS 1990; Parker and King 1990) – In general, a property is not eligible for inclusion in the NRHP if it represents a class of properties to which one or more of the seven criteria considerations listed in 36 C.F.R. Part 60.4 apply and is not part of a district that is eligible (Parker and King 1990; NPS 1990). These considerations are:
  - **Consideration A:** Ownership by a religious institution or use for religious purposes – A "religious property" requires additional justification for nomination because of the necessity to avoid any appearance of judgment by government about the merit of any religion or belief (NPS 1990).
  - **Consideration B:** Relocated properties – Properties that have been moved from their historically important locations are not usually eligible for inclusion in the NRHP because "the significance of (historic properties) is embodied in their locations and settings as well as in the (properties) themselves" and because "one basic purpose of the National Register is to encourage the preservation of historic properties as living parts of their communities" (NPS 1990).
  - **Consideration C:** Birthplaces and graves – Although not usually eligible for inclusion in the NRHP as such (NPS 1990), it is possible for the birth or burial itself to have been ascribed such cultural importance that its association with the property contributes to its significance.
  - **Consideration D:** Cemeteries – Cemeteries are not ordinarily eligible for inclusion in the NRHP unless they "derive (their) primary significance from graves of persons of transcendent importance, from age, from distinctive design values, or from association with historic events" (NPS 1997).
  - **Consideration E:** Reconstruction – A property constructed to reproduce the form and detail of a property or portion of a property that has vanished is not normally eligible for inclusion in the NRHP unless it meets strict criteria (Parker and King 1990; NPS 1990).
  - **Consideration F:** Commemoration – Properties constructed to commemorate a traditional event or person cannot be found eligible for inclusion in the NRHP based on association with that event or person alone (Parker and King 1990).
  - **Consideration G:** Significance achieved within the past 50 years – Properties that have achieved significance within only the 50 years preceding their evaluation are not eligible for inclusion in the NRHP unless "sufficient historical perspective exists to determine that the property is exceptionally important and will continue to retain that distinction in the future" (NPS 1997).

In addition to the considerations above, TCPs were defined and documented in terms of a given property's period of significance, boundary, and relevant setting (Parker and King 1990). A property's period of significance may be described in terms of traditional periods (e.g., the dawn of time) or by its period of use for traditional purposes.

A PA establishes a process for consultation, review, and compliance with federal and State preservation laws as the effects of the project on historic properties become known. ADOT would follow the terms and conditions of the Section 106 PA developed for the proposed action (Appendix 4-6, page A674). No ground-disturbing activities would be conducted until ADOT EPG has notified the District Engineer that the terms and stipulations of the PA have been fulfilled.

To mitigate impacts on the South Mountains TCP, ADOT and FHWA would fund an NRHP-eligibility report for the TCP to be prepared by the Community. The scope of the TCP report would be collectively established by the THPO, SHPO, ADOT, and FHWA, but would document the TCP and its importance to history, culture, traditions, and the ability to maintain and continue the cultural identity of the Community.

Consultation is continuing with the Community and other tribes regarding other appropriate mitigation strategies; selected, limited disclosures of locations of cultural resources sites; and other cultural resources issues related to the proposed action.

Other measures to reduce impacts on the NRHP-eligible cultural resources associated with the South Mountains include replacement lands, slope treatments, possible final design measures to reduce R/W needs, revegetation plans, visual buffering, and multifunctional crossings. These measures are further described in Chapter 5, *Section 4(f) Evaluation*, in the *Measures to Minimize Harm* sections beginning on pages 5-23, 5-26, and 5-27.

ADOT Design Responsibilities

The placement of a freeway between the Community and the South Mountains would affect access to culturally important places. Although pedestrian access to traditional cultural places would be modified extensively by the proposed action, access would be provided by proposed crossings under the freeway [see the section, *Biological Resources*, beginning on page 4-125, and Chapter 5, *Section 4(f) Evaluation*]. These multifunctional crossings would facilitate pedestrian access to culturally

Coordination Associated with the Section 106 Consultation Process

Coordination efforts regarding cultural resources were extensive (see Chapter 2, *Gila River Indian Community Coordination*; Chapter 6, *Comments and Coordination*; and Appendix 2-1, beginning on page A250). The following is a sample of the degree of coordination undertaken.

Agencies at the federal, tribal, State, and local levels have been engaged in document reviews, development of a PA for the proposed action, and the eligibility evaluation of cultural resources. NHPA Section 106 consultations were initiated with correspondence from FHWA in August 2003. The letter requested concurrence with the adequacy of the initial records search report and recommended that a PA be developed for the proposed action. Concurrence was received from SHPO, BLM, BIA, Reclamation, SRP, and the Hopi Tribe. The City of Phoenix's Pueblo Grande Museum concurred, with comments, and the City of Phoenix Historic Preservation Officer noted that no historic resources were included in the records search report. The Yavapai-Prescott Indian Tribe deferred participation in the proposed action to the southern tribes. No responses were received from ASLD, City of Avondale, City of Chandler, City of Tolleson, Tohono O'odham Nation, Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and the Yavapai-Apache Nation.

A draft PA to establish protocol and procedures to be followed for cultural resources investigations in the area covered by the agreement was prepared and submitted for concurrence in December 2003. Concurrence letters from SHPO, BLM, SRP, and the City of Phoenix's Pueblo Grande Museum were received, and Reclamation concurred, with comments. The Hopi Tribe declined participation in the PA (deferring to the Community), but requested continued participation in Section 106 consultations. Responses were not received from ASLD, the City of Phoenix Historic Preservation Officer, and the Community. In March 2004, ACHP was informed of the proposed freeway and the ongoing PA effort. Later that month, the Council responded that there was insufficient information to warrant its involvement, but the Council recommended that development of the PA continue.

The initial field survey report was distributed to the consulting agencies in July 2005, with a request for concurrence on the report's adequacy and eligibility recommendations. Concurrence with the report findings was received from BLM, Reclamation, and SRP. BIA concurred verbally in August 2005, and the City of Phoenix Archaeologist at the Pueblo Grande Museum concurred, with comments. In response to SHPO comments, the report was amended to include that isolated occurrences would be considered in the overall treatment plan, and ADOT again requested concurrence. SHPO concurred in January 2006 that the 19 prehistoric sites were eligible under Criterion D, but stated that a broader context would be required to understand the importance of the proposed action area and surrounding setting.

In July 2005, correspondence was sent to consulting Native American groups to 1) request concurrence on the adequacy of the field survey report, 2) request information on TCP concerns, 3) request concurrence on the draft PA, and 4) request participation as Concurring Parties to the PA (see Appendix 2-1, beginning on page A250). Concurrence letters with no TCP concerns were received from the Zuni Pueblo, the Yavapai-Prescott Indian Tribe, and the Fort McDowell Yavapai Nation. The Gila River Indian Community identified the South Mountains, Villa Buena, and Pueblo del Alamo as TCPs. No response was received from the Fort Yuma-Quechan Tribe, Fort Mojave Indian Tribe, Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribe, Ak-Chin Indian Community, Yavapai-Apache Nation, White Mountain Apache Tribe, Tonto Apache Tribe, Tohono O'odham Nation, San Juan Southern Paiute Tribe, San Carlos Apache Tribe, Salt River Pima-Maricopa Indian Community, Pascua Yaqui Tribe, Navajo Nation, Kaibab Paiute Tribe, Hualapai Tribe, and the Hopi Tribe.

Municipalities in the Study Area (other than Phoenix) were contacted in August 2005 to request concurrence on the adequacy of the draft PA and to request participation in the final PA; the Cities of Chandler, Avondale, Glendale, and Tolleson did not respond. Of 21 tribes that were requested to participate in the final PA, only the Salt River Pima-Maricopa Indian Community and the Tohono O'odham Nation concurred. The other 19 tribes did not respond.

In response to an additional August 2005 agency request to concur on the adequacy of the draft PA and to request participation in the final PA, only MCDOT concurred. FCDMC and RID did not respond.

Additional consultation occurred in August 2005, when agencies were asked to review and concur with the adequacy of the addendum record search and field survey reports. Reclamation concurred, and SRP and the City of Phoenix's Pueblo Grande Museum concurred, with comments. No response was received from ASLD, BLM, and the City of Phoenix Historic Preservation Officer. SHPO did not concur and requested revisions. The eligibility recommendations in the addendum reports were revised and resubmitted in late September 2005. SHPO concurred with the eligibility recommendations of the amended reports.

ACHP was notified of the revised PA in late September 2005. The Council responded in late December 2005 that its involvement was still not warranted.

Several December 2006 letters requested signatures on the final PA from those parties who had expressed an interest in participating in the PA. The final PA was signed by FHWA, SHPO, and ADOT. Concurring parties who signed the PA are SRP, MCDOT, the City of Phoenix, FCDMC, ASM, the Fort McDowell Yavapai Nation, the Tonto Apache Tribe, and the Yavapai-Apache Nation.

In August 2010 and June 2011, in response to requests from Western and BIA, respectively, FHWA revised the PA to include Western and BIA as concurring parties. Furthermore, FHWA and ADOT took the opportunity to invite Native American tribes that did not sign the original PA to participate as concurring parties.

See subsequent consultation efforts listed in Table 4-47.

important places. The E1 Alternative was designed to avoid a site that is a contributing element to the South Mountains TCP and an active shrine site, resulting in no adverse effects on these resources. Fencing along the sites at the R/W would limit access to the site by freeway users, but Community members would continue to gain access to the site as they currently do.

Many of the agricultural fields in the action alternatives' footprints have been in production with crops such as alfalfa that have prevented inspection of the ground surface for cultural resources. These gaps in the cultural resources inventory would be investigated by ADOT in the design phase, prior to any construction or other ground-disturbing activities.

Measures to avoid, minimize, and mitigate adverse impacts on the NRHP-eligible South Mountains, AZ T:12:112 (ASM), and AZ T:12:198 (ASM) TCPs would be considered (see Chapter 5) and approaches would be developed through consultation with the Community and other affected tribes.

Contractor Responsibilities

If previously unidentified cultural resources are encountered during activity related to the construction of the proposed freeway, the contractor would stop work immediately at that location, would take all reasonable steps to secure the preservation of those resources, and would notify the ADOT EPG Historic Preservation Team immediately to make arrangements for the proper treatment of those resources. The ADOT EPG Historic Preservation Team would, in turn, notify the appropriate agency(ies) to evaluate the significance of those resources.

SHPO CONCURRENCE

SHPO has been involved and will continue to be involved in the cultural resources issues related to the proposed action. SHPO concurred with the adequacy of the initial records search report and the draft PA for the proposed action. SHPO signed the PA in December 2006 and, following amendments to the initial field survey report, concurred that the 19 prehistoric sites were eligible under Criterion D, but stated that a broader context would be required to understand the significance of the Study Area and surrounding setting. SHPO did not concur with the eligibility recommendations of the addendum records search and field survey reports and requested revisions. The addendum reports were revised and resubmitted in late September 2005. SHPO concurred with the eligibility recommendations of the amended reports (see Appendix 2-1, beginning on page A250).

SHPO concurred with TCP eligibility, potential project effects, and proposed South Mountains TCP mitigation on May 15, 2012. SHPO concurred with the finding of no adverse effects on the Villa Buena and Pueblo del Alamo TCPs on October 25, 2012.

SHPO concurred with the initial eligibility recommendations for historic resources near Dobbins Road on July 19, 2006, and then with the approach to reassess the eligibility of these resources on February 4, 2011. SHPO concurred with the eligibility recommendations of the reassessment of Dobbins Road resources on July 16, 2012, and also concurred with findings of effect on these resources on September 14, 2012.

CONCLUSIONS

Coordination efforts to assess possible impacts of implementation of the proposed action on cultural resources have been extensive. As part of this coordination, adjustments have been made to the action alternatives to avoid and reduce impacts on known cultural resources in the Study Area. Avoidance of impacts entirely would not be possible; implementation of any of the action alternatives would affect prehistoric and historic cultural resources:

- Each of the Western Section action alternatives would cross the NRHP-eligible Wellton-Phoenix-Eloy main line of the historic Southern Pacific Railroad. The W59 (Preferred) and W71 Alternatives would cross segments of the Roosevelt Canal. All three action alternatives would cross prehistoric artifact scatters attributable to Hohokam habitation sites; archaeological testing is recommended to determine the full extent of the resources.
- The E1 (Preferred) Alternative in the Eastern Section would adversely affect NRHP-eligible archaeological sites and the South Mountains TCP.

Cultural resources impacts caused by implementation of any of the Western Section action alternatives would be inconsequential with respect to differentiating among the action alternatives. The types of impacts would be typical of those experienced in constructing and operating other parts of the region's freeway system. Impacts would be effectively mitigated through use of strategies outlined beginning on page 4-158. In addition, implementation of the enhancement and management plan for the Villa Buena and Pueblo del Alamo TCPs would prevent adverse effects on these sites. Impacts on the South Mountains TCP caused by implementation of the E1 Alternative in the Eastern Section would be substantial and unique in context, although limited in extent to less than 0.2 percent of SMPP and not prohibitive of ongoing access and cultural and religious practices by Native American tribes.

Under the No-Action Alternative, no project-related impacts on cultural resources would occur; continuing urban development from projected growth in the Study Area may result in the undocumented loss of cultural resources in the area. City of Phoenix ordinances do require developers to perform cultural resources studies to acquire building permits.

Mitigation measures are described previously in this section and more fully in Chapter 5, *Section 4(f) Evaluation*. Because effects on NRHP-eligible sites are not fully known, a PA has been developed and adopted. The PA describes the process for proper treatment and management of affected resources (see text box on the previous page).

PRIME AND UNIQUE FARMLANDS

AFFECTED ENVIRONMENT

An assessment of prime and unique farmlands (see sidebar for definitions of prime and unique farmlands) impacts was conducted to comply with the Farmland Protection Policy Act of 1981 (FPPA) (7 U.S.C. Chapter 73 § § 4201-4209). The FPPA, administered by the Natural Resources Conservation Service (NRCS), states that the purpose of the Act is "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, …" In addition, the FPPA states that federal programs shall be administered in a manner that, as practicable, would be compatible with State and local government and private programs and policies to protect farmland.

Existing Prime and Unique Farmlands

The presence of prime and unique farmlands in the Study Area was determined using the most current soil survey data (U.S. Department of Agriculture 1977) and aerial mapping to identify irrigated farmland with soil types that support prime and unique farmlands (NRCS 2007).

It is important to note that prime farmland and agricultural land (as identified in the *Land Use* section) are not necessarily the same. The agricultural land use designation is a product of local community planning efforts, while the prime farmland designation is a product of NRCS criteria such as soil type and availability of irrigation. Most of this land is located in the Western Section of the Study Area, with the Eastern Section acreage being located near 51st Avenue and Carver Road.

In general, Study Area agricultural land, including land under consideration as prime farmland, has been converted to other uses (e.g., residential, commercial, industrial developments) as planned and approved by local municipalities (see section, *Developments Plans*, on page 4-7, regarding the conversion of agricultural land). As such, this land has been and is projected to be a diminishing resource.

Criteria for Determining Farmland Impact

The Farmland Conservation Impact Rating is used to determine the relative impact of projects on land regulated by the FPPA. Land that receives a combined score of 160 points or more from the Land Evaluation and Site Assessment (LESA) criteria is protected by the Act. The U.S. Department of Agriculture recommends that sites receiving scores totaling 160 or more be given increasingly higher levels of consideration for protection [7 C.F.R. § 658.4(c)(3)]. If the LESA score is less than 160 points, the land need not be given further consideration for protection and no additional sites need to be evaluated. This land is, thus, not considered "farmland" as defined by the FPPA. The LESA score for action alternatives is determined by completing the NRCS-CPA-106 form, "Farmland Conversion Impact Rating for Corridor Type Projects." The NRCS-CPA-106 form, containing scoring for the proposed action, is in Appendix 4-7, beginning on page A692.

The LESA scoring system is a two-component, numerical rating system that measures the quality of farmland based on land evaluation and corridor assessment criteria. The land evaluation criterion (Part V of the NRCS-CPA-106 form) is used to assign a score of between 0 and 100 to groups of soil types based on their productivity and capability to support most types of crops. This portion is customarily completed by NRCS. The corridor assessment criteria (Part VI of the NRCS-CPA-106 form) is used to assign a score of between 0 and 160 to farmland within the Study Area based on multiple criteria that assess the suitability of each alternative for protection as farmland (7 C.F.R. § 658.5). NRCS has completed appropriate sections of the NRCS-CPA-106 form. ADOT has completed both Parts III and VI of the form to obtain scores.

The instructions that accompany the NRCS-CPA-106 form and 7 C.F.R. § 658.5(c) were used for guidance to complete the assessment portion, Part VI.

Procedurally, for projects where the value of Part VI is 60 points or more, the NRCS-CPA-106 form is forwarded to NRCS. NRCS is required by the FPPA to respond within 45 days. Where the LESA score (determined by combining results from Parts V and VI) is 160 points or greater, alternatives to avoid farmland impacts would be discussed with NRCS. If avoidance of farmland impacts would not be possible, measures to minimize or reduce the impacts would be evaluated.

ENVIRONMENTAL CONSEQUENCES

The types of environmental impacts expected as a result of the proposed action are:

- **direct conversion** – actions or projects that result in making land nonfarmable (an action on a specific area results in a direct impact)
- **cumulative** – may include isolation of remnant parcels (agricultural land that is bisected by a project such as a highway, resulting in two isolated parcels) (see section, *Secondary and Cumulative Impacts*, beginning on page 4-179)
- secondary – taking land adjacent to a specific impact area out of agricultural production (see section, *Secondary and Cumulative Impacts*, beginning on page 4-179)

All Action Alternatives, Western and Eastern Sections

All action alternatives would directly affect prime farmland by conversion. Depending on farm ownership and plot size, farmland not directly affected by R/W acquisition could become too small for continued economic use and be eliminated from further usefulness as farmland. An agricultural parcel that would be bisected by the proposed action and would become isolated parcel islands is an example of farmland that could become too small for continued economic use. In addition, on bisected parcels, farm equipment may have to be transported by the existing road network to gain access to agricultural land on opposite sides of the freeway.

Prime and unique farmlands

"Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary. Prime farmland includes land that possesses the above characteristics but is being used currently to produce live stock and timber. It does not include land already in or committed to urban development or water storage." [7 U.S.C. § 4201(c)(1)(A)]

"Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Examples of such crops include citrus, tree nuts, olives, cranberries, fruits, and vegetables." [7 U.S.C. § 4201(c)(1)(B)]

The action alternatives would not affect any wetlands that may be associated with agriculture (see June 14, 2002, letter from NRCS in Appendix 1-1, page A45).

Action Alternatives, Western Section

All Western Section action alternatives would convert agricultural land to a transportation use. The overall contribution of the conversion of agricultural land to nonfreeway-related uses would be negligible (see section, *Secondary and Cumulative Impacts*, beginning on page 4-179). Table 4-48 provides the acreage of prime and unique farmlands, by action alternative, that would be directly converted to nonagricultural uses.

In the Western Section, the W71 Alternative would convert the least amount of farmland to a transportation use.

Table 4-48 also summarizes the results for the impact rating analysis from the NRCS-CPA-106 form for the action alternatives in the Western Section. The LESA scores (Parts V and VI combined) for most action alternatives in the Western Section are at least 160 points. If an action alternative were to become the Selected Alternative, the NRCS-CPA-106 form should be resubmitted to NRCS for final evaluation and signature. If the returned scores remained 160 points or greater, technical assistance would, at that time, be requested from NRCS.

Action Alternative, Eastern Section

The E1 (Preferred) Alternative would convert agricultural land to freeway-related uses. Table 4-48 summarizes the total acreage of prime and unique farmlands to be directly converted and presents results for the impact rating analysis, from the NRCS-CPA-106 form, for the E1 Alternative.

The LESA score (Parts V and VI combined) for the E1 Alternative is less than 160 points. The score for the E1 Alternative must, however, be considered with the score for any of the action alternatives in the Western Section; therefore, NRCS technical assistance would be requested for the action alternatives in both the Western and Eastern Sections.

Table 4-48 Farmland Conversion Impact Rating, Prime and Unique Farmlands, Western and Eastern Sections

Action Alternative/ Alignment Option	Total Acreage to be Converted Directly (Part[a] III)	Impact Rating (Part V) Points	Impact Rating (Part VI) Points	LESA[b] Score
Western Section				
W59	588	85	74	159
W71	501	87	73	160
W101 Western Option	779–788	85–87	74	159–161
W101 Central Option	737–746	81–85	71–73	152–158
W101 Eastern Option	735–744	88	71–72	159–160
Eastern Section				
E1	135	88	15	103

[a] "Part" refers to the U.S. Department of Agriculture's Natural Resources Conservation Service's (NRCS) NRCS-CPA-106 form "Farmland Conversion Impact Rating for Corridor Type Projects," completed by NRCS.
[b] Land Evaluation and Site Assessment

Implementation of the E1 Alternative would cause no conversion of agricultural uses on Community land.

No-Action Alternative

Without the proposed action, the conversion of land from agricultural use to residential, commercial, and industrial uses is projected to continue. Because of the projected long-term urban growth of the Phoenix metropolitan area, farmland in the Study Area would continue to be lost through conversion to urban uses.

MITIGATION

ADOT Right-of-Way Group Responsibilities

During the design phase, ADOT would implement a R/W acquisition program in accordance with the Uniform Act (49 C.F.R. § 24) (see the section, *Displacements and Relocations*, beginning on page 4-46, for additional information regarding this law).

During the design phase of the proposed action, ADOT would coordinate with affected property owners as part of the R/W acquisition process to provide access, if possible, for farm equipment between divided agricultural parcels or to purchase remaining farm parcels considered too small to be farmed either economically or functionally.

ADOT District Responsibility

Farmland mitigation would include provision for access to farmland otherwise made functionally inaccessible by the project (FPPA Part 523.52 Exhibit C – Glossary). Additional mitigation measures may be considered based on NRCS guidance.

CONCLUSIONS

Congress enacted the FPPA to minimize the extent to which federal programs contribute to unnecessary and irreversible conversion of farmland to nonagricultural uses and to ensure that federal programs are administered in a manner that, to the extent practicable, are compatible with State, local government, and private programs and policies to protect farmland. Implementation of each of the action alternatives would be considered a federal action and each would convert farmland to a transportation use.

In the Western Section, the W71 Alternative would convert the least amount of farmland to transportation use. Farmland conversion to a transportation use would

increase with the more westerly action alternatives. Consequently, the W101 Alternative would have the greatest impact on farmland. Additional factors should be considered when reaching such a conclusion:

- The W59 Alternative is the most eastern of the Western Section action alternatives and, as planned, would closely follow the freeway alignment as it has been planned for over 20 years. Unlike with the W71 and W101 Alternatives, much of what has been planned along the W59 Alternative is commercial and industrial uses (more compatible with a freeway use).
- Urbanization is rapidly moving in a westward direction. By the time freeway construction would begin (if an action alternative were to become the Selected Alternative), it is likely that farmland acreage converted to transportation use for the westernmost alternatives would be less than now reported because such land would likely have already been converted from agricultural use to residential, commercial, and/or industrial uses, although some remnants of farmland may remain (see the section, *Development Plans*, on page 4-7, regarding the planned urbanization occurring in the Western Section).
- When considered as acres of farmland converted per freeway mile, impacts would be relatively comparable among action alternatives, with the exception of the W59 and W71 Alternatives, for reasons described in the respective sections.

Placed in context, the impacts on prime and unique farmlands from implementation of the proposed action, regardless of action alternative, would be negligible. Further, farmland impacts among action alternatives in the Western Section would be inconsequential in differentiating among the action alternatives.

Under the No-Action Alternative, no project-related impacts on farmlands would occur; continuing urban development would, however, result in the cumulative loss of farmland in the region, although some remnants of farmland would likely remain.

HAZARDOUS MATERIALS

AFFECTED ENVIRONMENT

A hazardous materials evaluation for the construction and operation of the proposed freeway was conducted to determine whether:

- contaminated soils would be present near potential hazardous materials sites
- underground storage tanks would need removal or relocation because of freeway construction
- wells and dry wells would be present, providing unintended conduits for preexisting or accidental releases from the construction process to groundwater supplies
- during construction activities, workers could encounter soil contaminated with hazardous materials that had not previously been identified

Aerial photographs and topographic maps indicate that development began in the northwestern section of the Study Area in the late 1950s. Several petroleum tanks and process buildings were located on the southwestern corner of 51st Avenue and Van Buren Street. The transportation system at that time consisted of light-duty roads and secondary highways.

Aerial photography since the 1980s indicates increased development in the entire Study Area. Specific points of interest in the 1980s-era aerial photography include:

- development of the Phoenix WWTP, located between 91st and 83rd avenues
- a sewage disposal area, located west of 91st Avenue between Buckeye and Lower Buckeye roads
- an increase in the number of tanks and buildings in the area bordered by 59th Avenue to the west, Van Buren Street to the north, 43rd Avenue to the east, and Buckeye Road to the south
- a gravel pit located west of I-10, south of Pecos Road (near Firebird International Raceway)

Heavy industrial and commercial land uses are now situated along I-10 between 19th Avenue and Litchfield Road and between Buckeye and McDowell roads. In the central and western portions of the Western Section, agricultural and residential are the predominant zoning classifications. Residential and undeveloped lands predominate in the Eastern Section.

ENVIRONMENTAL CONSEQUENCES

For this assessment (findings presented in Table 4-49), hazardous materials sites were classified as low-priority, medium-priority, and high-priority, as follows:

- **Low-priority** sites are those having few indications of potential for release of hazardous materials. On some occasions, sites that have had a hazardous materials issue in the past but have been remediated with approval of the State environmental agency (or EPA) may qualify as low-priority. Examples of low-priority sites include undeveloped or agricultural property, residential property, or benign commercial properties such as office buildings, warehouses, distribution facilities, or municipal facilities with no listed violation.
- **Moderate-priority sites** are those having some indications of possible hazardous materials issues. A moderate-priority site may appear on a database as having a permit to handle hazardous materials, but has recorded no violations to date. Another way that a site could be interpreted as a moderate priority would be if the environmental records search indicated no listing, but the site is an auto repair facility with visible surface staining. Examples of moderate-priority sites include auto repair garages, welding shops, or manufacturing facilities with minor listings in the environmental database.
- **High-priority sites** are those with high potential for releasing hazardous materials to the soil or groundwater, or those that have a recorded release issue. Examples of high-priority sites include current service stations, bulk fueling terminals, sites listed in the environmental database, or a known release that has not been remediated.

Sites that have more than one priority level are included in each appropriate priority column of Table 4-49 according to the highest priority level ranking.

Impacts on Action Alternatives, Western and Eastern Sections

Table 4-49 lists the number of potential hazardous materials sites by action alternative. The W59 (Preferred) Alternative would encounter the most high-priority sites. This is expected because the W59 Alternative is the closest of the action alternatives in the Western Section to urbanized Phoenix. The W59 Alternative would closely follow, along areas of commercial and industrial uses, the same general freeway alignment that has been accommodated for over 20 years.

The identified sites and specific recommendations for remediation are presented in the technical report *Draft Initial Site Assessment* (see sidebar on page 4-2 for

Table 4-49 Hazardous Materials Impacts, Action Alternatives

Action Alternative	Number of Potential Hazardous Materials Sites		
	Low-priority	Medium-priority	High-priority
Western Section			
W59	8	3	5
W71	13	4	4
W101	12	5	1
Eastern Section			
E1	0	0	0

Note: All options under the W101 Alternative would affect the same hazardous materials sites.

information on reviewing the report). It is important to note that approximately 1.5 mile of the W59 Alternative has no regulatory database coverage (approximately between Roosevelt Street and Buckeye Road). A field review conducted in 2009, however, indicated that few, if any, additional sites are likely to be identified in this section of the W59 Alternative. Several wells would be located within the action alternative alignments. (See the section, *Water Resources*, beginning on page 4-101, to learn more about proposed action effects on water wells.)

Action Alternatives, Western Section

W59 (Preferred) Alternative

The W59 Alternative would potentially affect five high-priority sites (including the West Van Buren Water Quality Assurance Revolving Fund [WQARF] site, discussed below) and three medium-priority sites. Each site is located either within the proposed W59 Alternative footprint or within a buffer area around the proposed footprint. Consideration of buffer zones is important because contaminants may travel laterally in the subsurface. Three of the high-priority sites are current service stations (Pilot Travel Center, Petrostop, and Circle K) and one is a Resource Conservation and Recovery Act large-quantity generator (Onyx Environmental Services).

Another high-priority site is the West Van Buren WQARF site, found within the proposed footprint but not within the construction zone, which is known to contain six contaminants in the groundwater at a depth of 30 to 60 feet. The contaminants with concentrations that exceed regulatory standards are tetrachloroethylene; trichloroethylene; 1,1-dichloroethylene; cis-1,2-dichloroethylene; 1,1-dichloroethane; and chromium. The depth of construction for the proposed project would have sufficient vertical separation from soil and groundwater affected by the West Van Buren WQARF site's plume of contamination.

W71 Alternative

The four high-priority sites are three current service stations (Arco, Flying J Travel Plaza, and Danny's Truck Stop) and the West Van Buren WQARF site.

The West Van Buren WQARF site, found within the proposed footprint but not within the construction zone, is known to contain six contaminants in the groundwater at a depth of 30 to 60 feet. The contaminants with concentrations that exceed regulatory standards are tetrachloroethylene; trichloroethylene; 1,1-dichloroethylene; cis-1,2-dichloroethylene; 1,1-dichloroethane; and chromium. The depth of construction for the proposed project would have sufficient vertical separation from soil and groundwater affected by the West Van Buren WQARF site's plume of contamination.

W101 Alternative

The one high-priority site is a current service station (SuperStar Chevron).

Action Alternative, Eastern Section

E1 (Preferred) Alternative

The E1 Alternative would not affect any known hazardous materials sites. A former air strip with remediated soils for a pesticide release is located on Community land near 51st Avenue. The site is located downslope and down gradient from the E1 (Preferred) Alternative and does not encroach on the planned construction area or R/W.

No-Action Alternative

No direct hazardous materials impacts are associated with the No-Action Alternative.

MITIGATION

When possible, avoidance or minimization is the primary mitigation for identified hazardous materials sites. The following list describes potential mitigation measures to avoid, reduce, or otherwise mitigate environmental impacts associated with the proposed action.

ADOT Design Responsibilities

- The *Draft Initial Site Assessment* recommends a site-specific Phase I assessment be performed prior to acquisition of each site. Based on preliminary information gathered for the corridor-wide Phase I assessment, none of the high-priority sites are believed to have hazardous materials issues significant enough to warrant avoidance of acquisition.
- ADOT would review the status of open regulatory cases relating to hazardous materials releases during the design phase. The responsible parties associated with any open regulatory cases would be determined at that time. ADOT would coordinate with the responsible parties to determine the status of any required cleanup actions.
- ADOT would conduct asbestos and lead-paint inspections of structures to be demolished and require abatement measures during demolition.
- The ADOT project manager would contact the ADOT EPG hazardous materials coordinator to determine the need for additional site assessment.

ADOT District Responsibilities

- Staging for construction activities near wells or dry wells would be located in areas where accidental releases of potential contaminants would be minimized and any accompanying threat to groundwater resources minimized.
- In cooperation with the contractor, ADOT's Construction District would develop and coordinate emergency response plans with local fire authorities, local hospitals, and certified emergency responders for hazardous materials releases or chemical spills.
- If suspected hazardous materials were encountered during construction, work would cease at that location and the ADOT Engineer would arrange for proper assessment, treatment, or disposal of those materials.

ADOT Right-of-Way Group Responsibilities

- Asbestos- and lead-paint-containing materials identified in structures to be demolished would be properly removed and disposed of prior to demolition.
- Any existing aboveground storage tanks or underground storage tanks would be removed or relocated.

Contractor Responsibilities

- The contractor would develop an on-site health and safety plan for construction activities.
- Staging for construction activities near dry wells would be located in an area where, if potential contaminants were to be accidentally released, any accompanying threat to groundwater resources would be minimized.
- If relocation or removal of an aboveground storage tank or underground storage tank were necessary, the removal/relocation activities would be addressed in accordance with the applicable laws and regulations of the State of Arizona.
- A hazardous waste management plan should be prepared for the handling of hazardous materials during construction.
- Use of asbestos-containing construction materials would be avoided during construction.
- The contractor would develop and coordinate emergency response plans with local fire authorities, local hospitals, and certified emergency responders for hazardous materials releases or chemical spills.
- If suspected hazardous materials were encountered during construction, work would cease at that location and the ADOT Engineer would be contacted to arrange for proper assessment, treatment, or disposal of those materials.

CONCLUSIONS

All action alternatives in the Western Section would potentially interact with known hazardous materials sites. The W59 (Preferred) Alternative would cross the most high-priority sites. The E1 (Preferred) Alternative in the Eastern Section would not affect any known sites. No substantial differences were identified when comparing the action alternatives; implementation of any of the action alternatives would not introduce unique impacts related to hazardous materials that would pose a threat to the human environment. Appropriate design, as commonly applied to projects of the size and features of the proposed action, would effectively mitigate hazardous materials-related effects.

Transport of Hazardous Materials on the Regional Freeway System

During public meetings for the proposed action, comments were received requesting restriction of the transportation of hazardous materials if the proposed action were constructed. Questions were raised about how restrictions would be imposed and why some state routes are restricted from hazardous materials transport.

Carriers of hazardous and radioactive cargo are responsible for planning their transportation routes. To plan hazardous material transportation routes, carriers use lists of designated and restricted routes, by state, published in the *Federal Register*.[44]

The federal government has given the States the responsibility of developing, implementing, and maintaining the list of designated and restricted routes. In Arizona, ADOT is responsible for the route designations and the Department of Public Safety is responsible for the enforcement of restrictions on the transport of hazardous materials along these routes. Also, local governments are given the responsibility for developing, implementing, and maintaining the list of designated and restricted routes within their respective jurisdictions; therefore, if a local government requests that ADOT restrict hazardous material transport through a particular area, it is ADOT's responsibility to analyze and adopt or reject that request. The agency's decision is based on a number of considerations, including, but not necessarily limited to, public safety and the presence of acceptable alternative routes (49 U.S.C. § 5112).

In Arizona, three routes are restricted for all hazardous materials (including radioactive materials):

- The I-10 Deck Park Tunnel in Phoenix from 7th Street exit to 7th Avenue exit – The restriction has been in place since the tunnel opened to traffic in 1990. ADOT imposed the restriction with involvement from the City of Phoenix, in particular the Phoenix Fire Department, because of the perceived increased danger of fires, explosions, and/or the release of toxic gases in a confined area. I-17 provides a close and suitable alternative to I-10 in this area.
- The exit ramp from U.S. Route 60 (US 60) (eastbound) to SR 101L (southbound) – The restriction was the result of constrained ramp geometry.
- SR 202L from MP 8.33 (McClintock Drive exit) to MP 11.07 (Dobson Road exit) – The restriction was the result of the freeway passing over a linear segment of the Salt River on an extreme skew for approximately a mile, with most of the bridge over the riverbed. The bridge has deck drains that discharge directly into the Salt River. The cost of collecting and retaining all drainage from the bridge was determined to be excessively high (and an engineering challenge); therefore, restriction of hazardous material from SR 202L was an environmental stipulation.

A local agency could request that ADOT restrict hazardous material routing on the proposed action; ADOT would, however, be required to analyze and adopt or reject the request based on its merits. Unless requested by a local agency or unless ADOT made the decision to restrict the transport of hazardous materials on the proposed action, the proposed road would be available for hazardous material transport.

Hazardous materials commodity flow studies and other information are used by emergency response planners (such as the Arizona State Emergency Response Commission statewide and the Maricopa County Local Emergency Planning Commission for Maricopa County) as one of the elements considered when developing emergency response plans. If the plan were amended, it would be made available to ADOT.

ADOT has made several formalized studies of hazardous materials transport in Arizona over the years. A 1986 study showed that the two most frequently shipped hazardous materials in Arizona are gasoline and paint products. ADOT has a continuing commitment to studying hazardous materials transport in the state. Both ADOT and the Arizona Emergency Response Commission are studying current hazardous materials traffic patterns in Arizona. The results of these studies will increase safety, improve emergency response planning, and provide objective data for hazardous materials routing.

Under the No-Action Alternative, no project-related interaction with hazardous materials would likely occur; continuing urban development over the long term would, however, possibly result in disturbance of known sites.

VISUAL RESOURCES

AFFECTED ENVIRONMENT

Pertinent Regulations and Guidance

Under NEPA, it is a policy goal for the federal government to:

> use all practicable means . . . [to] . . . assure for all Americans safe, healthful, productive, and *aesthetically and culturally pleasing surroundings* . . . [and to] . . . preserve important historic, cultural, and natural aspects of our national heritage, and maintain, whenever possible, an environment which supports diversity, and variety of individual choice . . . [§ 101(b)(2) and (4); emphasis added]

To this end, federal agencies are directed to:

> utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the *environmental design arts in planning and in decisionmaking* which may have an impact on man's environment . . . [§ 102(2)(A); emphasis added]

The process used to determine potential impacts of the proposed transportation corridor on existing visual resources generally followed FHWA Technical Advisory T 6640.8A (1987) and FHWA guidelines outlined in *Visual Impact Assessment for Highway Projects* (1988).

Local Setting

The Study Area lies within the Basin and Range Physiographic Province, characterized by rocky mountain ranges that alternate with desert basins as the primary landform organization. Dominant landforms visible in the Study Area are the Sierra Estrella, the South Mountains, and the Salt and Gila river valleys. Elevations along the various proposed action alternatives range from approximately 1,160 feet above mean sea level at Pecos Road (eastern end) to about 1,015 feet above mean sea level where 99th Avenue intersects I-10 (Papago Freeway). Numerous viewpoints in SMPP provide panoramic vistas and views of adjacent landforms, agriculture, and urban development in the Study Area.

The Study Area is located in the Sonoran Desert scrub vegetative community, characterized by saguaro, bursage, creosote bush, ocotillo, prickly pear/cholla, paloverde, and ironwood. Native plant communities have been substantially replaced by crops and ornamental plants in the agricultural and urban areas. Outstanding natural features in the viewshed include prominent off-site landforms and vistas across the lowlands of the Community land to the south. Lone Butte is an identifiable landmark just south of the Eastern Section of the Study Area. The Sierra Estrella defines the background to the majority of the westward views. The mountain range also provides distinct rugged landforms and skyline character.

The northwestern portion of the Study Area is level agricultural land that is rapidly transitioning to warehouse and distribution facilities, light industrial uses, and to medium-density housing. The South Mountains and the Sierra Estrella provide backdrops to many southerly and easterly views in this area. Throughout the Study Area, views of SMPP are available because of the steep rise in elevation of the South Mountains (see the text box on the next page for a typical view from the South Mountains). This fault-block desert mountain range provides a distinctive backdrop to the north along Pecos Road in the Eastern Section of the Study Area and is visible from most anywhere in the Study Area.

Visual Quality, Visual Character, and Viewer Sensitivity

The Study Area was evaluated in terms of the existing visual conditions and landscape character. The visual conditions analysis consisted of identifying distinct features, areas of preservation and disturbance, and key landmarks, and of locating major viewpoints. Distinct features comprise landscape elements and patterns that make a memorable visual impression. Major viewpoints offer distant views of distant landforms/landmarks that attract attention away from the foreground area (the area within 0.25 mile of the viewer's position).

The Study Area was subdivided into Visual Assessment Units (VAUs) based on landform, land use, length, and the presence of special features in the foreground, middleground, and background. In particular, these units were defined by observable changes in the primary biotic community as marked by vegetation, land use and visual character, and viewpoint (to or from the action alternatives) as well as by the presence of special features in the landscape. For the action alternatives in the Western Section of the Study Area, 32 VAUs were developed along the proposed alignments. Twelve additional VAUs were identified and analyzed along the existing I-10 (Papago Freeway) and SR 101L freeways in the northern portion of the Western Section. The action alternative in the Eastern Section was divided into 6 VAUs. The proposed action alternatives were not anticipated to affect the 12 additional VAUs' visual resources in the Western Section because the existing freeway corridors are well-established and any changes in visual quality would be low. Therefore, the project team did not include these units in its assessment because they would tend to artificially lower (dilute) the values of the impact assessments without providing any corresponding ability to distinguish visually preferable alternatives or options. Any potential impacts at system traffic interchange locations would be captured in the terminal VAU along a given alternative's corridor.

ENVIRONMENTAL CONSEQUENCES

Potential impacts of the proposed action were assessed against the current visual setting. The impact analysis sought to evaluate the effects on the scenic quality and cohesiveness that each of the proposed alignments would have on the area's visual conditions. The Study Area landscapes are in the state's major metropolitan area. Most VAUs have only low-to-moderately low visual quality and offer only relatively modest visual quality when considered on a statewide basis. For a major urban area, however, the Study Area contains high-to-moderately high-quality views of the region's mountains. For the most part, implementation of any of the action alternatives would not adversely affect these views. The analysis was able to discriminate among action alternatives in terms of the degree of change in visual quality between the pre- and postproject conditions.

Components Used in Assessing Impacts on Visual Resources

Visual quality or attractiveness is a combination of attributes based on landforms, water characteristics, vegetation patterns, and architectural/cultural elements. For each VAU, the relative distinctiveness/vividness, intactness, and unity of the landscape were determined. Visual quality was rated in seven rankings, from "very low" to "very high," depending on the distinctiveness, unity, and intactness of the patterns and attributes of the VAU. Unity is the visual coherence and harmony of the landscape when considered as a whole. Visual intactness relates to the integrity of the visual order in the natural and built landscapes and the extent to which landscape elements and the patterns that they create cohere. The level of visual intactness was expressed as "low," "medium," or "high."

Using this process, the existing visual quality of the Study Area was determined to be generally in the moderate-to-low range for most VAUs. Several VAUs, primarily associated with industrial and warehouse activities, scored in the low range. The VAUs nearest the western end of SMPP are relatively undisturbed or have lower levels of disturbance that could reduce visual quality; these scored in the moderately high range.

Visual character, or landscape character, is the physical appearance of the landscape, including the natural, physical, and architectural/cultural features that give it an identity and "sense of place." It is the order and composition of the elements of form, line, color, and texture that make up the visual landscape. It is a value-free measure in that changes in visual character are neither "good" nor "bad." There are few highly distinctive features in the Study Area except for SMPP and the Salt River channel. Land use is a patchwork of residential, industrial, and agricultural, creating heterogeneous settings of forms, colors, and textures. Most individual Study Area land uses, however, lack diversity and have few dominant elements.

Visual sensitivity is a relative measure of viewer response to changes in the landscape. The primary viewer types in the Study Area include local residents (the majority of existing viewers), businesspersons, SMPP visitors, and daily commuters to destinations in the Study Area and in the Phoenix metropolitan area. Residents would likely respond to changes in the scenic quality of the landscape as viewed from their homes. Scenic viewing for these residents would also occur from local streets and parks. Views from SMPP would include vantage points from dispersed recreational activities such as hiking and mountain biking. Most viewers from areas of warehouse or industrial use (e.g., the Salt River channel, near I-10) would be assumed to have lower sensitivity to landscape changes.

This residential landscape is unified, intact, and harmonious—well representing the visual quality component.

This agricultural scene exhibits strong elements of form, line, color, and texture—well representing the visual character component.

Hikers in the far western end of SMPP would likely notice any adverse visual changes in views toward the Sierra Estrella. Such landscapes well represent the visual sensitivity component.

Action Alternatives, Western and Eastern Sections

Determination of the visual impacts of the proposed freeway were qualitatively made based on an evaluation of the changes in visual quality, on an assessment of the overall change in visual character, and on the likely sensitivity of the most likely frequent Study Area viewers to changes in the visual landscape. Appendixes B and C in the technical report, *Visual Resources Report*, describe the process the project team employed to evaluate visual impacts and display the details of the results (see sidebar on page 4-2 for information on reviewing the report). The setting, especially in the Western Section of the Study Area, is somewhat similar for each action alternative. Therefore, a quantitative method that took into account small changes within each proposed corridor was developed to determine the magnitude of visual change. The approach considered the distribution of landscape features and land use in each action alternative to compare the alternatives' visual impacts.

Construction and operation of the proposed freeway would facilitate access to views of the Gila River Valley between the Sierra Estrella and the South Mountains. More people would be exposed to views of these fault-block mountains so close to central Phoenix. For some people, the freeway might provide a superior driving experience, visually, compared with driving through downtown Phoenix using I-10.

Action Alternatives, Western Section

Table 4-50 displays the visual impacts projected to be caused by the action alternatives in the Western Section. The greater the number, the greater the visual impact that would be experienced with construction and operation of the given action alternative.

In the Western Section, residential areas, expanses of agricultural fields, and natural areas such as the Salt River channel drive higher visual impact scores. Warehouses and light and heavy industry generate the least visual impact changes because of their low sensitivity to visual change. The degree to which specific corridors would avoid directly conflicting with the most visually sensitive land uses largely determined overall visual impacts. In the relatively flat landscape of the Western Section action alternatives, distances of even a half mile would provide substantial buffering from much of the adverse visual impacts of the proposed project.

W59 (Preferred) Alternative

Largely because of the buffering provided by the land use controls undertaken over the years since the South Mountain Freeway was first proposed in the 1980s, reduced viewer sensitivity and exposure meant low visual impacts for this alternative, particularly along its southern portion. Land uses that would conflict with a freeway have been somewhat constrained along this alignment, despite its proximity to Phoenix's urban growth. Construction of a system traffic interchange at I-10 (Papago Freeway) would entail substantial visual impact, but it would be in an area of existing freeway impacts and of warehouse and light industrial activity. The W59 Alternative would cross Dobbins Road near 62nd Avenue, thereby avoiding direct and adverse impacts on nearby historic properties [see Chapter 5, *Section 4(f) Evaluation*, for more information]. Blending colors, lines, textures, and forms of the freeway with the surrounding environment would reduce its visual impact on the historic resources. Because the freeway would be elevated over Dobbins Road, aesthetic treatment of the overpasses would help diminish any visual impacts and could, over time, help unify what may become a visually complex landscape. Ideas illustrated in the text box on the previous page would help protect the visual integrity of the historic properties and the visual unity of the proposed freeway in its increasingly urbanizing context.

W71 Alternative

While the W71 Alternative would create the most visual impact of all the Western Section action alternatives, the impacts would not be substantially different from that of the other action alternatives. It ranked highest (most impact) in terms of visual sensitivity, the visual element that caused it to have the highest overall impact. The W71 Alternative would cross or be near numerous residential areas. Using a length-weighted approach (VAU score divided by VAU linear feet), three of the eight highest-rated (most adversely affected) VAUs are in the W71 Alternative corridor and W101 Alternative Eastern Option.

W101 Alternative

Because of their location farther west than the other alternatives, the options under the W101 Alternative scored in the middle to low range in terms of visual change. This is largely attributable to having retained much agricultural land use because the land is farther from Phoenix and because of the existence of warehouses and light industry along I-10. Relative to the W71 Alternative, there is less residential development that would be disrupted, and industrial activities would experience little change in viewer sensitivity by having a transportation facility nearby. Because of the greater height and mass, increased number of travel lanes, and likely perceived complexity, construction of a system traffic interchange at I-10 (Papago Freeway) and SR 101L would create a visual impact substantially greater than that from a system traffic interchange at either of the other two action alternatives' intersections with I-10 (Papago Freeway).

Action Alternative, Eastern Section

E1 (Preferred) Alternative

The evaluation of visual impacts for the Eastern Section VAUs and the E1 Alternative followed the same analytical steps as used for the Western Section action alternatives. The results are summarized in Table 4-50. The overall visual impacts would be substantially higher than for any of the Western Section action alternatives. This is chiefly attributable to the severe visual impacts that would accompany the road cuts at the western end of the South Mountains, altering views from the Community north to the mountains and altering views from the mountains to the Community to the south and southwest. Also, the proximity of numerous residences along Pecos Road creates high viewer sensitivity to disturbances in these views.

Table 4-50 Visual Impacts, Action Alternatives

Action Alternative	Magnitude of Change			Overall Impact on Visual Resources
	Visual Quality	Visual Character	Visual Sensitivity	
Western Section				
W59	1.79	1.65	1.68	1.71
W71	1.75	2.29	2.33	2.12
W101 Western Option	1.97	2.03	1.29	1.76
W101 Central Option	1.90	1.90	1.63	1.81
W101 Eastern Option	1.71	1.98	1.52	1.74
Eastern Section				
E1	1.99	2.86	2.72	2.52

Note: Valuations derive from analytical procedures described in the *Visual Resources Report* (see sidebar on page 4-2 for information on reviewing the report). "Magnitude of Change" refers to the difference in the evaluations of the three visual resource assessment components (see previous page), before and after the proposed freeway's construction, i.e., the visual impact. Using the state's landscapes as the basis of comparison, impacts to visual resources from the action alternatives were evaluated on a scale of 1 to 3, with 3 representing the most severe impact. In general, areas of low to moderately low initial visual quality would tend to experience only moderate or low visual impact with construction and operation of a freeway. This conclusion is generally applicable across all action alternatives, except for those in areas with the highest initial visual quality (e.g., near Phoenix South Mountain Park/Preserve) or with the most sensitive viewers (e.g., close to recreation areas or residential communities). Higher numbers mean greater visual impact. "Overall Impact on Visual Resources" is the average of these three components' impacts, standardized by each respective action alternative's length.

Attention was given to the sensitive views along the E1 Alternative, including views from SMPP, views from residential areas in Ahwatukee Foothills Village, views from the Community, and views of the major road cuts at the western end of SMPP. Hikers and other users of SMPP would have distant, elevated, open views of the proposed action, with the closest views being from some of the most popular trails in the park. Sketches of these views, with the proposed project, are in the *Visual Resources Report* (see sidebar on page 4-2 for information on reviewing the report) (also, see simulations in Figure 5-9, on page 5-16). The proposed freeway would be readily visible from houses directly fronting Pecos Road on its northern side and from Community land on its southern side. During the design phase, the sizes and locations of any noise barriers or retaining walls that might become part of the proposed action (see the text box on the previous page and

the section, *Noise*, beginning on page 4-88, for additional information regarding noise barriers) would be determined. Farther north, the proposed freeway would be less visible because of intervening houses, vegetation, and, in many cases, topography. It is only with an increase in elevation, along the side slopes of the South Mountains, that the freeway would become visible; at these distances (1–1.5 mile or more) from the proposed freeway, its visibility and any change in visual quality would be minimal, given that Pecos Road is already a four-lane, divided road. Service traffic interchanges would be only moderately elevated and would result in only moderate visual impacts beyond those existing with the divided, four-lane Pecos Road.

No-Action Alternative

The No-Action Alternative would result in no direct change in visual character or quality because it would not involve freeway construction. Over time, the visual character and quality of the Study Area would be expected to change because of the Phoenix metropolitan area's continued urban development. Urban expansion would inevitably replace rural or undeveloped portions of the Study Area. The loss of rural or natural areas would potentially reduce the visual quality of the Study Area. If low-visual-quality development were to occur, there would be an additional reduction of overall visual quality. If future development, however, were harmonious with existing Study Area visual elements and patterns in terms of scale, color, line, and form, beneficial effects may be realized.

MITIGATION

ADOT Design Responsibilities

The following list describes measures that ADOT might employ to avoid creating visual impacts, reduce such impacts, or otherwise mitigate visual impacts associated with the proposed project. Upon review of these measures, ADOT, along with FHWA, may choose to modify or delete measures or may choose to add new measures to avoid, reduce, or mitigate impacts. During the design phase, ADOT would evaluate:

- leaving in place rock outcrops—if stable and not a hazard to the traveling public—not interfering with construction or looking out-of-place in the natural landscape
- using vegetative buffers to screen views both of the road and from the road
- transplanting larger saguaro cacti, mature trees, and large shrubs likely to survive the transplanting and setting-in period to visually sensitive or critical roadway areas
- blending retention basins and their landscape treatments into their natural surroundings
- placing landscape treatment on the periphery of R/W areas at overpass locations as well as at other areas adjacent to residential development
- clustering or grouping plant material in an informal pattern to break up the linear form of the freeway
- using strategic gaps in plantings to frame positive views from the road
- using earth colors for overpasses, retaining and screen walls, and noise barriers
- using natural-tone metals with a noncontrasting, nonglare finish for guardrails and handrails
- using riprap that blends with the surrounding rocks and exposed soil color
- using shotcrete that matches the color and texture of adjacent rocks
- using bridges and overpass structural systems that help unify a visually complex landscape
- minimizing structural sizes and/or recessing the face of structural members from the edge of the roadway to reduce real or apparent breadth of structures

The use of treatments and patterning on noise barriers and screen walls, piers, concrete barriers, retaining walls, and highly visible headwalls is an opportunity for exercising community aesthetic preferences. ADOT maintains a palette of treatments that it is willing to incorporate into such structures. If a community through which the proposed freeway would pass were to request other treatments, such efforts may be negotiated with ADOT. Treatments beyond the ADOT standard palette may be more expensive to construct and/or maintain. In such cases, a given community may wish to cover the additional expenses to secure the desired treatment.

The extensive and high road cuts proposed for the western end of the South Mountains would incorporate the newly exposed rock faces characteristic of the adjacent natural rock features, including scale, shape, slope, and fracturing to the extent that could be practicable and feasible as identified through geotechnical testing and constructibility reviews. ADOT would require the contractor to round and blend new slopes to mimic the existing contours to highlight natural formations. ADOT would evaluate having the contractor adjust and warp slopes at intersections of cuts and natural grades to flow into each other or transition with the natural ground surfaces without noticeable breaks.

CONCLUSIONS

Implementation of any of the action alternatives would introduce a substantial human-made feature (the proposed action) into the environment. Project impacts would be incurred for all residents, including low-income residents. In the Western Section, any of the action alternatives would be visually consistent with the development occurring and projected to continue to occur; differences in visual impacts among the action alternatives would be negligible.

In the Eastern Section, the E1 (Preferred) Alternative would be visually inconsistent with the natural setting in and around the South Mountains. The E1 Alternative would cut through a series of three ridgelines; the severe cuts and the freeway would be visually inconsistent with the natural setting of the surrounding area. In the easternmost portion of the Eastern Section, the proposed action would replace an existing four-lane, east–west arterial street along the southern edge of a primarily built-out community; at this location, the proposed action would be more intensive than the visual effect created by the arterial street. Some Study Area residents with distant views of the surrounding agricultural land and mountains may find such views adversely affected by implementation of the proposed action.

Noise barriers would offset some adverse impact on foreground viewsheds created by the freeway, but the noise barriers themselves could cause viewshed impacts.

Aesthetic Treatment of Freeway Structures

Portions of the proposed freeway would require structures, including noise barriers (some in the form of walls). ADOT has received public input requesting additional information on how structures are aesthetically treated and how the public could be directly involved in developing aesthetic treatments. The requests stem in part from the different appearances of freeway structures throughout the region.

Decorative or aesthetic treatments are sometimes applied to noise barriers and other freeway structures to help them blend into the surroundings and/or fit in with the tone of the community. The ADOT Roadside Development Section is responsible for assigning a wide range of standard treatment applications and wall materials, including color, to noise barriers. Typically the community where the wall will be constructed will work closely with its City Architect or planning department to decide on a theme for the wall. Most times this can be accomplished from ADOT's standard applications. ADOT has expanded its selection of acceptable wall treatments to include thematic emblems or symbols and, in some cases, more than one color.

As an example, for SR 101L (Pima Freeway) in Scottsdale, the City of Scottsdale chose to add public art to the sound barriers. The City's intent went above and beyond ADOT's guidelines of reasonable aesthetics and, therefore, ADOT did not fund the aesthetic portion of the project. ADOT and the City of Scottsdale entered into an intergovernmental agreement (IGA) for the purposes of allowing Scottsdale rights to design and construct artistic embellishment on the ADOT-supplied noise barrier. ADOT provided the funds for construction of the noise barriers themselves, but the City of Scottsdale provided the funds to cover the aesthetic portion of the walls. In the end, the City of Scottsdale contributed funds considerably greater than those initially estimated for the aesthetic treatment.

Like the above example, a municipality can be entirely responsible for the aesthetic treatment, although ADOT's Roadside Development Section is normally responsible for these functions. An IGA entered into between ADOT and the municipality would typically establish lines of responsibility. In one instance, the municipality maintained artistic control of the design throughout the process while ADOT provided suggestions in relation to aesthetics, directed issues centered around traffic speeds correlated to the size of the imagery, and maintained final approval of design plans and had the authority to request design changes if the proposed imagery was in any way offensive or otherwise distasteful.

Below are examples of the process that could occur to determine aesthetic treatment of structures:

- As general practice, ADOT's Roadside Development Section would work with the local jurisdiction to develop a theme for the noise walls from the standard, approved ADOT wall applications. Once a theme is decided on, the Roadside Development staff would design the aesthetic treatment.
- ADOT and the local jurisdiction would collaborate to develop a theme for the noise walls and design the aesthetic treatments. In this instance, a different design outside of standard ADOT applications could be applied while still having ADOT fully involved in the process. This option may require the local jurisdiction to contribute a portion of the funds necessary for the aesthetic treatment.
- ADOT and the local jurisdiction could engage the public in either of the above scenarios. The public would be provided the opportunity to comment on and make suggestions for the aesthetic treatments. When conducted this way, often a citizens committee is formed to contribute to the design process.
- In the unusual circumstance that none of the above options are adequate, an option exists for the local jurisdiction to initiate an IGA with ADOT. This would allow the local jurisdiction to have primary artistic control over the aesthetic treatment of structures. In this scenario the local jurisdiction would be solely responsible for all design costs and any added construction costs of the advanced aesthetic treatments. Using more than one color for the aesthetic treatments is acceptable if the local jurisdiction commits to maintenance.

Examples of aesthetic treatments on freeway-related structures in the Phoenix metropolitan area

Most single-family residences are, however, bounded by cinder-block walls that serve to obstruct foreground and long-range views. Further, ADOT would work with municipalities' staff to incorporate aesthetically pleasing features into the project to offset impacts. Regardless, some views would remain adversely altered.

Under the No-Action Alternative, no project-related visual impacts would occur; however, continuing urban development—primarily in the Western Section—would transform views of remaining agrarian landscapes to views of homogeneous suburban residential and commercial landscapes.

ENERGY

This section discusses the energy that would be used within the region for the No-Action and action alternatives. Primary energy use would be fossil fuel consumption by vehicles traveling within and around the Study Area. Other energy use would be associated with construction, maintenance, and development activities. Fuel would be consumed during the planned construction of new arterial streets and freeways identified in the RTP and regional transportation programs. Also, fuel would be consumed during construction of commercial developments, industrial buildings, and residences throughout the Study Area and surrounding region. Operational energy use was calculated using VMT and vehicle hours traveled projections from the MAG travel demand model, vehicle mix percentages from the Maricopa County vehicle registration records, and fuel economy data from the U.S. Department of Energy's Energy Information Administration.

AFFECTED ENVIRONMENT

The average fuel economy of the nation's vehicles, measured in miles per gallon (mpg), has been consistently improving over the past 40 years, and this trend is expected to continue during the next 20 years. Barring a technological breakthrough in the engines providing power to the vehicles of 2035, a substantial change in fuel economy is unlikely and, therefore, not assumed in the analysis. Even with such a breakthrough, penetration of a new technology across the country's total vehicle fleet can take decades. The average fuel economy of a passenger car operated in the United States in 1991 was 21.1 mpg and, 20 years later in 2011, it was 23.1 mpg (Energy Information Administration 2013). Automobiles are most efficient when operating at steady speeds between 35 mph and 45 mph with no stops (Oak Ridge National Laboratory 2002; USDOT 1983). Fuel consumption increases by approximately 30 percent when speeds drop from 30 mph to 20 mph, and a drop from 30 mph to 10 mph results in a 100 percent increase in fuel use. Similarly, fuel consumption increases by approximately 17 percent as speeds increase from 55 mph to 70 mph.

Total fuel consumption in the United States has consistently risen from year to year through 2007. From 1987 to 2007, motor vehicle fuel consumption increased from 125 to 176 billion gallons per year in the United States. Since 2007, fuel consumption has remained flat at around 170 billion gallons per year. In 2011, the state of Arizona consumed 3.4 billion gallons per year, or 2 percent of the national total (USDOT Bureau of Transportation Statistics 2013). Increased congestion on freeways and arterial streets has become a major contributor to the increase in fuel consumption. The *2012 Annual Urban Mobility Report* (Texas Transportation Institute 2012) reported that vehicles in the Phoenix urban area consumed approximately 46 million gallons of excess fuel in 2011 because of congestion.

Table 4-51 Annual Regional Energy Consumption, 2035

		No-Action Alternative	Action Alternative		
			W59/E1	W71/E1	W101/E1
Vehicle Miles Traveled per Year[a] (millions)		46,001	46,559	46,558	46,558
Operational Energy Use[b] (millions of gallons per year)	Passenger cars[c]	1,610	1,595	1,598	1,596
	Light-duty trucks[c]	550	545	546	546
	Heavy-duty trucks[c]	714	708	709	708
	Total	2,874	2,848	2,853	2,850

Note: Operational energy use for action alternatives was calculated by combining action alternatives from the Western and Eastern Sections.

[a] Vehicle miles traveled per year (VMT/yr) were calculated from daily VMT estimates provided by the Maricopa Association of Governments in its travel demand model (2013c). Daily estimates were converted to annual estimates by assuming 6 days per week (the equivalent of 1 day of traffic for Saturday and Sunday combined) and 52 weeks per year.

[b] Gallons/year data were determined by dividing the VMT for each category by an assumed base fuel economy factor for each class, adjusted by miles per gallon according to speed (VMT/vehicle hours traveled). Base factors were obtained from the Monthly Energy Review (Energy Information Administration 2013).

[c] Vehicle mix data were derived from Maricopa County vehicle registrations as projected by the Maricopa Association of Governments through 2035. Gasoline and diesel vehicles for all classes were combined. Buses were added to the heavy-duty trucks category. Motorcycles and alternative fuel and electric vehicles were assumed to have an insignificant contribution.

ENVIRONMENTAL CONSEQUENCES

Impact Overview, All Alternatives

Construction activities for any of the action alternatives would have comparable fuel commitments. While the No-Action Alternative would not need fuel for construction, other road projects and improvements would need to be developed in the Study Area to accommodate the region's growth. Construction energy use is not addressed in further detail because the total fuel needed for construction of the action alternatives is assumed to be essentially the same as the total fuel needed for construction of other road projects under the No-Action Alternative.

Operational energy use was calculated by dividing the yearly VMT projections for each of the action alternatives and for the No-Action Alternative by the fuel economy of the different classes of vehicles. The analysis included light-duty cars, light-duty trucks, and heavy-duty trucks and buses, which have average fuel economies of 23.1 mpg, 17.1 mpg, and 6.3 mpg, respectively (Energy Information Administration 2013). Fuel economies were adjusted for each alternative based on the projected average speed (mph), and were calculated by dividing the VMT by the vehicle hours traveled.

Table 4-51 shows that among the action alternatives, operational energy use is essentially the same and that all action alternatives are projected to result in less fuel consumption than the No-Action Alternative. Implementing the W59, W71, or W101 Alternative with the E1 Alternative would reduce fuel consumption regionwide by up to 26 million gallons per year when compared with the No-Action Alternative. Although the No-Action Alternative shows the smallest VMT of all the alternatives, substantially more fuel use is projected because of the higher vehicle hours traveled. Lower speeds and, therefore, lower fuel economy are associated with the No-Action Alternative.

If the No-Action Alternative were to become the Selected Alternative, energy use due to project construction would not occur; operational energy use, however, would be higher because of higher levels of traffic congestion.

MITIGATION

No mitigation is proposed for energy use associated with the proposed action.

CONCLUSIONS

The No-Action Alternative would involve the most energy consumption of all of the alternatives. In 2035, it would consume up to 26 million gallons of fuel per year more than any of the action alternatives. The annual fuel consumption savings associated with any of the action alternatives would represent substantial economic savings over the design life of the freeway, regardless of fluctuations in fuel prices.

TEMPORARY CONSTRUCTION IMPACTS

Construction activities would have a temporary impact on businesses and residences in the Study Area. During construction, motorists and other people living and working in the surrounding area could experience temporary inconveniences associated with traffic delays, detours, and construction dust and noise.

Potential construction impacts for each action alternative and measures to reduce impacts are presented in this section. The following environmental categories have been considered in this analysis: air quality, noise, water resources, socioeconomic conditions, pedestrian and vehicular traffic, utilities, and visual resources. Construction impacts on biological resources and cultural resources are presented in the sections, *Biological Resources* and *Cultural Resources*, on pages 4-125 and 4-140, respectively.

ENVIRONMENTAL CONSEQUENCES AND MITIGATION

All Action Alternatives, Western and Eastern Sections

Air Quality

Construction air quality impacts of the proposed action would be limited to short-term increased fugitive dust and mobile source emissions. CO is the pollutant of concern when considering localized air quality impacts of motor vehicles. Because CO emissions from motor vehicles increase with slower speeds, disruption of traffic during construction could result in short-term elevated concentrations of CO because of the temporary reduction of road capacity and increased queue lengths. To minimize emissions, efforts would be made during the construction phase to limit disruption to traffic, especially during peak travel periods.

A traffic control plan would be developed and implemented (as described later in this section) to help reduce impacts of traffic congestion and associated emissions during construction.

Fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and other earthmoving vehicles operating around the construction sites. Increased dust levels would be attributable primarily to PM resuspended by vehicle movement over paved and unpaved roads and other surfaces, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on size, height at which the emission occurs, and wind speed. Small particles (30- to 100-micron range) can travel more than 30 feet before settling to the ground, depending on wind speed. Most fugitive dust, however, is made up of relatively large particles (i.e., greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20–30 feet of their source.

To reduce the amount of construction dust generated, particulate control measures related to construction activities must be followed. The following mitigation measures would be followed, when applicable, in accordance with the most recently accepted version of the ADOT *Standard Specifications for Road and Bridge Construction* (2008).

- Site preparation
  - Minimize land disturbance.
  - Use watering trucks to minimize dust.
  - Stabilize the surface of dirt piles if not removed immediately.
  - Use windbreaks to prevent accidental dust pollution.
  - Limit vehicular paths and stabilize temporary roads.
  - Prevent dirt from being tracked or washed onto paved roads, by using 50-foot-long track-out pads consisting of 12-inch-deep aggregate, 3 to 6 inches in diameter, placed over geotextile fabric adjacent to paved roads.
- Construction
  - Use dust suppressants on unpaved travel paths.
  - Minimize unnecessary vehicular and machinery activities.
  - Prevent dirt from being tracked or washed onto paved roads, by using 50-foot-long track-out pads consisting of 12-inch-deep aggregate, 3 to 6 inches in diameter, placed over geotextile fabric adjacent to paved roads.
  - To the extent practicable, construction equipment that meets EPA's Tier 4 emission standards shall be used.
  - Where feasible, construction equipment powered by alternative fuels (e.g., biodiesel, compressed natural gas, electricity) shall be used.
  - ADOT would provide training to contractor's personnel regarding air quality impacts from construction activities, potential health risks to nearby receptors, and methods to reduce emissions.
- Postconstruction
  - Revegetate or use decomposed granite on all disturbed land (see section, *Mitigation*, beginning on page 4-138, regarding applicable measures to reduce impacts on biological resources).
  - Remove dirt piles and unused materials.
  - Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

In accordance with Maricopa County Rule 310, Fugitive Dust Ordinance, the contractor shall obtain an approved "Application for Earth Moving Permit, Demolition, and Dust Control Plan" prior to construction from MCAQD for all phases of the proposed action. The permit would describe measures to control and regulate air pollutant emissions during construction.

Noise

Construction noise differs from traffic noise in several ways (see text box on page 4-98 regarding construction noise).

- Construction noise can be louder than traffic noise, but lasts only during the construction contract and is usually limited to the daylight hours, when most human activity occurs.
- Construction activities generally are of a short-term nature, and, depending on their nature, such activities could last from seconds (e.g., a truck passing a receiver) to months (e.g., construction of a bridge).
- Construction noise is also intermittent and dependent on the type of operation, location, function of the equipment, and the equipment use cycle. Traffic noise, on the other hand, is present in a more continuous fashion after construction activities are completed.

Public awareness during construction

As projects transition into construction, ADOT maintains its dedication to communicating with the public. Public information meetings are typically held at the beginning of construction activities, informing communities of the upcoming improvements and work schedules. The public can also be kept informed through construction updates/newsletters, fliers, project information hotlines, Web sites, periodic meetings, project offices, and radio and newspaper advertising. See Chapter 6, *Comments and Coordination*, for additional information regarding public interaction for the proposed action.

Land uses near the proposed freeway would be exposed to noise from construction activity if any of the action alternatives were the Selected Alternative. The only differences between alternatives would be the location where construction would occur. As noted, the impacts would be temporary, ending upon completion of construction.

To minimize noise impacts from construction activities, the following measures would be implemented for the Selected Alternative:

- All equipment exhaust systems would be in good working order. Properly designed engine enclosures and intake silencers would be used.
- Equipment would be maintained on a regular basis.
- New equipment would be subject to new product emission standards.
- Stationary equipment would be located as far away from sensitive receivers as possible.
- Construction-related noise generators would be shielded from noise receivers (e.g., use temporary enclosures to shield generators or crushers, take advantage of site conditions to provide topographic separation).
- Construction alerts would be distributed to keep the public informed of construction activities and a toll-free number for construction-related complaints would be provided.
- During the design phase, hours of operation would be evaluated to minimize disruptions during construction.

Water Resources

Construction activities for all action alternatives would result in the potential for soil erosion and subsequent increased sediment loading into Study Area receiving waters. Without protective measures during construction, these conditions could persist until the proposed freeway were completed, when permanent measures would be established to minimize impacts on the quality of the receiving waters.

The types of construction-related impacts on water quality would be similar among the action alternatives. Each action alternative would require earthwork with the potential to adversely affect water quality in adjacent receiving waters in the Study Area. The permitting processes described in the sections, *Water Resources* and *Waters of the United States*, beginning on pages 4-101 and 4-116, respectively, outline procedures to mitigate water quality impacts during construction.

Socioeconomic Conditions

Construction may temporarily disturb access to local businesses in the Study Area. The effect would be expected to be minimal because most of the freeway would be built on a new alignment. Mitigation of potential business impacts would be achieved using traffic control management procedures set forth in ADOT's *Standard Specifications for Road and Bridge Construction* (2008).

A majority of the construction jobs would be filled by the regional labor force and thus would benefit regional employment broadly due to multiplier effects. The jobs would not disproportionately benefit minority and low-income populations in the absence of special recruitment, training, or job set-aside programs.

Pedestrian and Vehicular Traffic

Construction would temporarily affect traffic movement, on-street parking, and access to adjacent properties along existing streets during times that construction activity would occur (e.g., during interchange construction). The number of lanes along existing arterial streets near construction may need to be reduced at times. Detours may be necessary at some locations.

Congestion from construction-related traffic would create temporary impacts in the project vicinity. The magnitude of these impacts would vary, depending on the location of sources of fill material and of disposition sites for surplus material, land uses along the routes, duration of hauling operations, staging locations, and construction phasing. To identify acceptable routes and times of operation, ADOT, or its representative, would prepare an agreement with local agencies regarding hauling of construction materials on public streets.

Traffic would be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of FHWA's *Manual on Uniform Traffic Control Devices*, 2009 edition, and by the Arizona Supplement to Part VI of the *Manual on Uniform Traffic Control Devices* (ADOT 2012d). In planning traffic control measures, the contractor would coordinate with potentially affected public services. Access would be maintained during construction, and construction activities that might substantially disrupt traffic would not be performed during peak travel periods. To minimize disruption, ADOT would coordinate with local jurisdictions regarding traffic control and construction activities during special events. Requirements for the use of construction notices and bulletins would be identified as needed. The effectiveness of the traffic control measures would be monitored during construction and any necessary adjustments would be made.

Cultural Resources

Pedestrian access to the TCPs would not be precluded during construction, but might temporarily involve out-of-direction travel. It is understood that Community use of the TCPs is not seasonal, so avoidance of impacts would not be possible through construction scheduling. All TCPs would be appropriately protected (e.g., temporary fencing) during construction.

Utilities

Table 4-52 shows the major existing public utilities within the alignments of the action alternatives. Lengths of impact shown in this table are at the planning level and are subject to change. ADOT would coordinate with the responsible local entities regarding the relocation of utilities, as appropriate. ADOT coordination with affected utilities would be ongoing and would continue through the design phase. Utilities with prior rights would be relocated at ADOT cost according to the requirements of the utility.

Disruptions to utility services, if necessary, would be restricted to being short term and localized. Advanced planning would be accomplished during the Selected Alternative's design phase (if an action alternative were identified as the Selected Alternative) so that interruptions in utility services to customers would not occur or would be minimized. ADOT and project contractors would continue to coordinate with utility providers during the design phase and during project construction to identify potential problems and/or conflicts and to provide opportunities for their resolution prior to proposed actions. Replacement

and/or relocation of utilities would be coordinated with ADOT construction activities and other projects in the area to minimize disruption to adjacent properties and traffic. Planning for the proposed action, if an action alternative were to become the Selected Alternative, would include scheduling of disruptions and prior notification of adjacent property owners who would be affected by temporary service cutoffs. Emergency response procedures would be outlined by ADOT in consultation with local utility providers to ensure quick and effective repair of any inadvertent or accidental disruptions in service.

Visual Resources

Temporary construction features, such as excavation areas, soil stockpiles, crane towers, equipment and materials storage, false work, and other miscellaneous items, would be visible from surrounding land. Temporary visual impacts would be greatest where the freeway route would be located adjacent to existing residential developments and where large system traffic interchanges would be constructed. No mitigation measures are proposed.

Section 4(f) Resources

Trails near and adjacent to the proposed action would experience temporary closures or detours during construction for safety reasons. In the event of short-duration closure, the remaining portions of the trail would remain accessible.

No-Action Alternative

No construction-related impacts would result from this alternative.

CONCLUSIONS

Construction activities associated with a project the size and magnitude of the proposed action would create temporary impacts on human and natural environments. Throughout the Phoenix metropolitan area, ADOT and FHWA have demonstrated experience in the construction of projects like the proposed action. Similar measures outlined in this section and in previous sections of this chapter (e.g., *Topography, Geology, and Soils*, beginning on page 4-121) have been applied to those projects and have proven effective in reducing construction-related impacts.

Table 4-52 Potential Major Utility Impacts, Action Alternatives

Utility	Western Section										Eastern Section	
	W59 Alternative		W71 Alternative		W101 Alternative Western Option		W101 Alternative Central Option		W101 Alternative Eastern Option		E1 Alternative	
	Line Type	Length of Impact (feet)	Line Type	Length of Impact (feet)	Line Type	Length of Impact (feet)	Line Type	Length of Impact (feet)	Line Type	Length of Impact (feet)	Line Type	Length of Impact (feet)
Cable	OH[a] FO[b]	1,300	OH FO	4,185	OH FO	1,030	OH FO	1,030	OH FO	1,030		
			UG[c] cable	690	UG FO	1,340	UG FO	1,260	UG FO	1,890		
			UG FO	1,150	OH cable	1,770	OH cable	2,910	OH cable	1,585		
									UG cable	465		
Gas	7"[d]–10"	650	7"–10"	1,630	7"–10"	740	7"–10"	1,960	7"–10"	2,310	7"–10"	2,750
	17"–30"	540	17"–30"	635	11"–16"	930	11"–16"	1,920	11"–16"	1,765	11"–16"	1,575
					17"–30"	620	17"–30"	990	17"–30"	720		
Phone	CenturyLink	15,895	CenturyLink	17,885	CenturyLink	17,965	CenturyLink	13,705	CenturyLink	11,270	CenturyLink	22,585
	AT&T	605	AT&T	640	Sprint	750	Sprint	940	Sprint	1,160		
	Sprint	1,300	Sprint	840								
Power	OH SRP[e]	15,940	OH SRP	9,190	OH SRP	5,000	OH SRP	6,575	OH SRP	6,535	OH Western	830
	OH Western[f]	470	OH Western	1,200	OH Western	515	OH Western	490	OH Western	645	UG SRP	3,880
	UG SRP	1,300	UG SRP	1,630							OH SRP	1,175
	OH APS[g]	470									OH APS	400
Sewer	17"–30"	10,480			31"–48"	2,965	17"–30"	2,375	17"–30"	3,675	31"–48"	19,790
	>49"	3,200			>49"	8,290	31"–48"	5,715	31"–48"	7,940		
							>49"	10,270	>49"	7,990		
Water	11"–16"	4,760	11"–16"	5,570	11"–16"	1,560	11"–16"	9,760	11"–16"	8,370	11"–16"	1,355
			>49"	2,655							31"–48"	34,445
Irrigation	SRP siphons	3,235	SRP siphons	3,805	SRP siphons	4,200	SRP siphons	4,200	SRP siphons	4,200	SRP laterals	790
	SRP laterals	19,230	SRP laterals	23,115	SRP laterals	25,405	SRP laterals	24,045	SRP laterals	25,145		
	RID[h] canal	565	RID canal	1,210								

[a] overhead [b] fiber-optic [c] underground [d] inches [e] Salt River Project [f] Western Area Power Administration [g] Arizona Public Service [h] Roosevelt Irrigation District

MATERIAL SOURCES AND WASTE MATERIAL

The design of a large-scale project such as the proposed action requires careful consideration of how to balance earthwork needs with available fill material in the area. In some cases, the excavation of project facilities such as drainage basins produces fill material that can be used elsewhere on the project to support construction of raised facilities such as traffic interchanges. In cases where the project does not produce enough fill material to meet the needs of a project, other suitable sources of material must be found.

ENVIRONMENTAL CONSEQUENCES

Action Alternatives

The proposed action—including the freeway main line, system and service traffic interchanges, drainage channels, and drainage basins—was modeled to estimate earthwork quantities. Cut material is excess material generated as a result of project construction (e.g., from the excavation of a drainage basin). Fill material is the material needed to complete the project construction (e.g., to support a ramp leading to a bridge). The earthwork material deficit is an approximation of what would be needed to complete construction of the proposed project—in other words, the amount of borrow material that would be needed. Although the freeway would generally be aboveground throughout the corridor, construction of the freeway would generate material that could be used as fill material elsewhere on the project. Material that is not suitable to be used as fill material, or as waste material, would need to be disposed. Table 4-53 lists earthwork quantities needed for each action alternative.

Table 4-53 Earthwork Quantities, Action Alternatives

Action Alternative	Quantities (approximate millions of cubic yards)		
	Fill (material needed)	Cut (material generated)	Deficit[a]
Western Section			
W59 Alternative	9.70	5.90	3.80
W71 Alternative	8.25	8.00	0.25
W101 Alternative Western Option[b]	9.00–11.00	8.50	1.00–2.00
W101 Alternative Central Option[b]	11.00–13.00	10.00	1.00–2.00
W101 Alternative Eastern Option[b]	11.00–13.00	8.50	2.00–4.00
Eastern Section			
E1 Alternative	11.00	6.40	6.20

[a] Some of the deficits do not total correctly. This is because certain assumptions were used for material shrinkage, compaction, topsoil planting, overexcavation, and recompaction under embankments.
[b] Ranges are provided because these action alternatives have Partial and Full Reconstruction Options.

In the Western Section, the W71 Alternative would have the smallest deficit, needing approximately 0.25 million cubic yards of borrow material. The W101 Alternative Eastern Option would have the largest deficit, needing approximately 4 million cubic yards of borrow material.

The Eastern Section E1 Alternative would need approximately 6.2 million cubic yards of borrow material. The earthwork quantities for the E1 Alternative are highly dependent on the suitability of the cut material from the South Mountains.

With regard to project construction, major sources of cut material would include:

- mountain foothills near Desert Foothills Parkway
- cuts through the South Mountains
- large drainage basins
- semidepressed portion of the freeway at Dobbins Road (for the W71 and W101 Alternatives)
- a drainage channel and large drainage basin south of Broadway Road
- side slopes along I-10 (Papago Freeway)

Additionally, ADOT-approved material sources are located within and around the Study Area. The contractor would ultimately be responsible for locating material to meet the projected deficit and disposing of any unsuitable material. Material source locations would be selected by the contractor, although any selected source must be examined for environmental effects by the contractor, prior to use, through a separate environmental analysis in accordance with ADOT's *Standard Specifications for Road and Bridge Construction*, Section 1001 Material Sources (2008 Edition) (Stored Specification 1001.2 General).

No-Action Alternative

No borrow material would be needed for this alternative.

MITIGATION

Contractor Responsibilities

The contractor would use material sources from the ADOT *Contractor-Furnished Materials Sources List*. If the source that the contractor prefers to use is not on the ADOT list, then the contractor would complete ADOT EPG's Material Source Environmental Analysis Application in accordance with ADOT's *Standard Specifications for Road and Bridge Construction*, Section 104 Material Sources (2008 Edition) (Stored Specification 104.12 General) prior to using material from that source.

Contractor-furnished material sources must go through a process to obtain environmental clearance for use on ADOT projects. The material source owner or operator must submit a Material Source Environmental Analysis Application, with cultural survey and reports, to ADOT EPG. After receiving the completed application, ADOT EPG would initiate a cultural consultation process. Upon successful completion of this process, the material source would receive a tracking number and may be included on the ADOT *Contractor-Furnished Materials Sources List*.

CONCLUSIONS

Construction of the proposed project would need between approximately 6.45 million and 10.2 million cubic yards of borrow material, depending on the selected action alternative in the Eastern and Western Sections—if an action alternative were to be selected. In the Eastern Section, the needed amount would be approximately 6.2 million cubic yards of borrow material. In addition, depending on the action alternative chosen for the Western Section, the amount of borrow material would vary between 0.25 million and 4 million cubic yards. The W71 Alternative would need the least amount, at 0.25 million cubic yards, and the W101 Alternative Eastern Option would potentially need the largest amount—4 million cubic yards. These amounts are not considered excessive for a project of this size. The contractor would ultimately be responsible for locating additional material to meet the projected deficit and for disposing of any unsuitable material.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction and operation of the proposed action would involve a commitment of a range of resources, including construction materials, fuels, land, labor, and financial assets. Some resources would need an irreversible commitment during the life of the proposed action. Others would not be retrievable even beyond that time. Any of the action alternatives would need a similar commitment of these resources.

Land within the R/W would be unavailable for other purposes during the time that it is used as a highway facility. Conversion of land now used as farmland, commercial, industrial, residential, and other urban development into the proposed action would be irreversible. If a greater need arose for use of the land or if the freeway were to be no longer needed, however, the land could be converted to another use. There is no reason to believe that such a conversion would ever be necessary or desirable. In the event land were converted, a return to agricultural uses would be unlikely. Thus, the loss of farmland would be permanent and irretrievable.

Considerable expenditures for labor and consumption of energy and of highway construction materials, such as cement, aggregate, and bituminous material, would be needed in the construction of the project. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. This expenditure for labor and materials generally is considered not retrievable. Labor and materials for this type of project, however, are not expected to be in short supply, and the use of such labor and materials would not have an adverse effect on continued availability of these resources. The commitment of these resources is based on a public policy that the project would provide measurable benefits to area residents, including:

- improved accessibility within the community and to other portions of the greater Phoenix metropolitan area
- reduced traffic congestion and a corresponding increase in safety and time savings
- improved availability of community services
- improved opportunities for economic development and job creation

When constructing the proposed action, ADOT, or its agent, would commit to materials reuse, wherever appropriate and feasible. A substantial expenditure of public funds would be needed to construct the proposed action. These funds, which are derived from taxes imposed at different levels of government, would not be retrievable. Their use is determined, however, through national, statewide, regional, and local planning efforts and engaged by elected officials and area citizens. The expenditure of these funds would also create new opportunities for economic activities, such as new jobs, that would result in the generation of increased tax revenues.

The commitment of resources necessary to build and operate the proposed action would be based on the concept that residents and other users in the immediate area, region, state, and the country would benefit from the proposed transportation facility. These benefits would consist of improved accessibility and safety, reduced traffic congestion, and savings in time. These benefits would outweigh the commitment of resources.

RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Short-term adverse impacts would occur during construction of the proposed action. Such impacts would be similar for any of the action alternatives. Long-term impacts would occur over the life of the proposed action and would have a positive effect.

Impacts during construction (see the section, *Temporary Construction Impacts*, beginning on page 4-173) would include effects on air quality, noise, water resources, socioeconomic conditions, pedestrian and vehicular traffic, utilities, and visual resources. These effects would, however, be temporary, lasting only as long as the construction activity. Relocations of residents and businesses would occur under any of the action alternatives. Immediately preceding construction, the displacement of businesses could result in a lessening of economic activity in the immediate area. The consequence would be a temporary decrease in property and sales taxes. Potential tax losses should be offset by the construction jobs that would be created by the proposed action and by opportunities for new development, especially near the interchanges.

Long-term impacts would generally be beneficial. Accessibility between the immediate area and other parts of the metropolitan area would be enhanced (see Chapter 1, *Purpose and Need*). Traffic congestion would be reduced and safety improved. More efficient energy use and a decrease in vehicle emissions would result.

Completion and operation of the proposed action would serve future economic development in the area. The new development would create additional jobs and generate a substantial increase in sales and property taxes. On balance, the use of resources and the associated short-term impacts would lead to long-term benefits in the area. These benefits would accrue in both the Study Area and in the greater Phoenix metropolitan area.

SECONDARY AND CUMULATIVE IMPACTS

Phoenix has grown from a small agricultural town to a major metropolitan area (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5). Growth is expected to continue and result in secondary and cumulative effects on the area's natural resources, communities, residents, infrastructure, and economic conditions.

OVERVIEW OF HISTORIC, EXISTING, AND FUTURE CONDITIONS

Demographics

Population in the Study Area is projected to grow by 53 percent from 2010 to 2035. From 1990 to 2010, population grew by more than 80 percent, so the trend of fast growth seen in recent decades is likely to continue (note discussion of recent economic downturn, on page 1-11). Employment is projected to grow by 71 percent from 2010 through 2035. In line with these projections, 102 development proposals, largely consisting of new residential subdivisions, were identified for the Study Area (see the section, *Development Plans*, on page 4-7).

Within the Study Area, minority populations account for 68 percent of the population, more than the average for Maricopa County (41 percent). Low-income population percentages are also above the Maricopa County average of 14 percent, with 16 percent of the Study Area population identified as low-income.

Land Use and Ownership

Much of the Study Area was converted to agricultural use prior to the 1950s. Urbanization generally began in the 1950s and has now reduced agricultural and undeveloped land to 22 and 10 percent of the Study Area, respectively.

Approximately 57 percent of the Study Area is developed, with residential (30 percent single-family and 2 percent multifamily), commercial (4 percent), industrial (15 percent), transportation (2 percent), or public/quasi-public land uses (4 percent). The I-10 (Papago Freeway) corridor is the most intensely developed portion of the Study Area. Moving south from I-10 (Papago Freeway), the Study Area is characterized by increasingly less dense development. Much of the Goodyear area included in the Study Area is undeveloped, attesting to the lower density of development west of the Phoenix metropolitan center (see the section, *Existing Land Use, Land Use Trends, and Ownership*, beginning on page 4-3, for related information). Analysis of secondary and cumulative impacts revealed little difference (with one exception) among the action alternatives. Therefore, except where noted, the impacts discussion focuses on the proposed action, which considers all of the action alternatives.

SECONDARY IMPACTS

Regulatory Basis

Secondary impacts (sometimes referred to as indirect impacts) are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Secondary impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 C.F.R. § 1508.8). An example is how the construction of a new highway interchange at a cross street can attract the building of a new gas station.

FHWA implements NEPA and CEQ guidelines under 23 C.F.R. § 771 (FHWA 1992). FHWA has interim guidance on secondary (indirect) and cumulative impact analysis (FHWA 2003). The FHWA interim guidance supplements the CEQ guidance; combined, they provide the primary basis for analysis. The information presented follows two principles outlined by the CEQ guidance (1997) in considering secondary and cumulative analyses: 1) focus only on the effects and resources within the context of the proposed action, and 2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.

Analysis of Potential Impacts

Resources Not Subject to Secondary Impact Analysis

The relation of the proposed action to social, cultural, technical, economic, and natural components of the environment was reviewed to determine the potential for secondary impacts to occur. Based on this assessment, certain resources were excluded from analysis. The rationale for determining which resources would not be given further consideration for secondary impact analysis is presented in Table 4-54.

Resources Subject to Secondary Impact Analysis

The effects among action alternatives are anticipated to be comparable. Critical issues warranting secondary impact analysis are biological resources, water resources, air quality, cultural resources, land use, and economic conditions. (One secondary impact under economic conditions would result from the W101 Alternative and its Options. The direct impact of land conversion to a nontaxable land base by the alternative would lead to a substantial reduction in the City of Tolleson's tax revenues. The secondary effect would be sufficient to lead to possible reductions in the provision of public services to city residents. The impact is discussed further in the section, *Economic Impacts*, beginning on page 4-56). The resource, the proposed action impact, and reasonably foreseeable impact are presented in Table 4-55.

Induced Travel

Induced travel is a phrase used to describe observed traffic volume increases occurring on a new highway after it is opened. The observation is prominent in areas where congestion is already evident (the Phoenix metropolitan area is an example).

Table 4-54 Resources Not Considered for Secondary Impact Analysis

Resource	Rationale
Topography	While the proposed action would alter topography in the Study Area, the direct impacts from the proposed action are adequately presented in the *Topography, Geology, and Soils* section of this chapter. Therefore, no further consideration is given because the proposed action is not expected to cause topographic changes beyond direct impacts.
Energy	While construction and operation of the proposed action would result in the direct use of energy, the proposed action and its alternatives would not use energy at a magnitude or rate beyond consumption as determined if no action were undertaken. Therefore, no further consideration will be given because the proposed action is not expected to vary usage levels considerably from existing and projected traffic patterns.
Utilities	While construction of the proposed action would require the relocation and adjustment of utilities, no new utility projects are identified in the Study Area to support the proposed action. Therefore, no further consideration is given.
Environmental justice	The evaluation to determine whether disproportionate impacts on any environmental justice population would occur revealed that all action alternatives would have direct impacts on Title VI and environmental justice populations. The proposed action would be accessible to all populations in the Study Area, the impacts would not be disproportionately high on any population, and mobility benefits would occur. Benefits would include enhanced access to and from employment opportunities and enhanced movement of goods and services for improved access to such goods and services for all population segments. Therefore, no secondary impacts would occur.
Recreational land	Section 6(f) lands would not be affected by the proposed action and, therefore, no further consideration is warranted. The Section 4(f) process required consideration of direct and indirect impacts; therefore, the Section 4(f) evaluation performed for this project adequately considered secondary impacts, and no further consideration is given to recreational land.
Noise	Noise is an unwanted sound that can intrude on and have effects on the resources of the human and natural environments. The noise analysis conducted for the proposed action took into account projected future noise from traffic on the proposed action. No additional noise would be expected because of the proposed action; therefore, no further consideration is given.
Hazardous materials	Hazardous material sites are a byproduct of the human environment. The *Hazardous Materials* section of this chapter considered the direct and indirect potential for the proposed action to disturb such sites; therefore, no further consideration is given.
Demographics	Because this project and other transportation projects have been designed to respond to population forecasts (as opposed to encouraging population growth where it might not otherwise occur), no secondary impacts on demographics have been identified. Therefore, no further consideration is given.
Wild and scenic rivers	No wild and scenic rivers occur in the Study Area; therefore, no secondary impacts would occur. No further consideration is given.
Sole source aquifer	No sole source aquifers occur in the Study Area; therefore, no secondary impacts would occur. No further consideration is given.
Floodplains	The proposed action may cause changes in land development at select locations adjacent to its alignment. In some instances, such changes may be proposed within designated floodplains in the Study Area. Ultimately, however, incompatible use or development within floodplains would not be facilitated by the proposed action. Developments in the area must comply with State and local zoning and floodplain ordinances; therefore, no secondary impacts would occur.
Visual quality	The proposed freeway would be a part of the transition in land use from low-density, open uses to residential, commercial, and light industrial uses. This is a trend that is underway and would continue with or without the proposed freeway. The road cuts proposed for the western end of the South Mountains and the direct impacts from the proposed action are adequately presented in the *Topography, Geology, and Soils* section of this chapter and no additional impacts would occur; therefore, no secondary impacts would occur.

The proposed action would be constructed where existing traffic congestion has already decreased travel speeds throughout much of the Regional Freeway and Highway System and the major arterial street network. To avoid congestion, over time, some travelers have diverted to alternative routes, changed the time of day they make their trips, switched to different travel modes, traveled to other destinations, or decided not to make a particular trip at all. Because the proposed action would carry substantially more traffic before it would become congested, many of these travelers may switch to the new facility when opened to take advantage of decreased travel times. Some travelers using transit as a choice may also switch and, further, some may choose to travel to different (more distant) destinations (e.g., for shopping) or take a trip that they previously avoided altogether because it was previously "too much trouble" to make. The behavior triggering such a switch is often associated with drivers' perceptions of a decreased generalized cost of travel, including both travel time and out-of-pocket costs. It is commonly recognized, however, that the causes of this "switch" are more complex and involve various travel behavior responses, evolving individual needs, residential and business location decisions, and changes in regional population and economic growth.

Some induced travel would represent new trips. Most of the increase in traffic caused by induced travel, however, is expected to come from trips already being made before the proposed action would be put into operation (predictable traveler behavior accounted for in the travel demand forecasts conducted for the proposed action). The resulting traffic increase on the proposed freeway would also be expected to be largely offset by decreases in traffic volumes on parallel routes and at other times of the day. It is fully expected that the net effect on daily VMT in the region as a result would be minimal. Examples in the region where this phenomenon has been experienced include the openings of SR 101L (Pima Freeway) in Scottsdale and of SR 202L (Red Mountain Freeway) in Mesa.

SR 101L (Pima Freeway) was opened to traffic in 2002, from SR 202L (Red Mountain Freeway) to I-17. The section from the Red Mountain Freeway to Shea Boulevard was opened in 1999. On opening, changes in traffic volumes were experienced on Hayden and

Table 4-55 Secondary Impacts, Action Alternatives

Resource	Proposed Action Impact	Reasonably Foreseeable Impact
Biological	Habitat loss from direct conversion to transportation use	Habitat loss from urban development
	Vehicle-animal collisions	Wildlife population reduction
	Loss of native vegetation	Increased rate of land conversion
Water	Loss and/or alteration of natural drainage features	Loss from urban development
	Modification of groundwater tables from pumping to drain a depressed facility: eventual impact on the water table by removing this water from use	Groundwater drawdown from continued development
Air quality	Particulate matter attributable to construction activities	Construction activities related to continued rapid urban growth in the region
Cultural resources	Disturbance to known historic and prehistoric sites	Enhanced access to undisturbed land
	Discovery of previously unknown cultural resources	Discovery of previously unknown cultural resources related to ongoing urban development
Land use	Conversion of agricultural land to other uses	Ongoing residential, industrial, and commercial development
	Land use ownership and conversions	Conversion of zoned parcels to more intensive land uses
	Alteration of community character	Ongoing residential, industrial, and commercial development and its effect on community character
Economic conditions	Enhanced movement of goods, people, and materials; property value changes	Projected growth in land values and economic activity in Study Area

Scottsdale roads (both parallel the Pima Freeway 1 mile and 2 miles to the west, respectively). Both are major arterial streets with cross sections of four to six lanes.

The analysis, conducted by the City of Scottsdale, illustrates a reduction in traffic along both major arterial streets after the freeway was completed. Traffic reduction on Hayden Road ranged from 13,900 to 48,300 vehicles per day (vpd), with an average reduction of 31,000 vpd. Scottsdale Road, which is farther away from the freeway, experienced a reduction of between 2,100 and 13,300 vpd, with an average reduction of 10,000 vpd.

The Red Mountain Freeway, from its interchange with SR 101L to Gilbert Road, was opened to traffic in 2002, and the extension to Higley Road was opened in 2003. On opening, changes in traffic volumes were experienced on McDowell, McKellips, and Brown roads (all generally parallel the Red Mountain Freeway 1, 2, and 3 miles to the south, respectively). All are major arterial streets with cross sections of four to six lanes.

The analysis, conducted by the City of Mesa, illustrates a reduction in traffic along all three major arterial streets after the freeway was opened. The traffic reduction on McDowell Road ranged from 6,300 vpd to 9,900 vpd, with an average reduction of 8,600 vpd. The traffic reduction on McKellips Road ranged from 2,300 vpd to 33,900 vpd, with an average reduction of 19,000 vpd. The traffic on Brown Road ranged from an increase of 300 vpd at the eastern end to a reduction of 9,700 vpd, with an average reduction of 4,500 vpd. The largest reduction was on the western end of the road, near Country Club Drive.

Both examples provide insight to general driver behavior. At the time of opening, both freeways represented driver savings in time and/or travel costs. Consequently, drivers moved from the arterial street network to the freeway system. Over the course of time, it would be expected that some drivers would return to the arterial street network as more vehicles traveled on the freeways. For the proposed action, a net reduction on the arterial street network would be anticipated through the design year of 2035 because traffic volumes on the arterial street network would be projected to be less with the proposed action in place than without the proposed action.

For the proposed action, the minimal contribution to overall traffic use by induced travel would be expected to have both positive and negative consequences (positive effects on the neighboring road network have been previously addressed). Changes in driving behavior leading to the use of the proposed action would be the result of perceived benefits, which could include reduced total daily travel time and cost or an increased value associated with a new destination (e.g., a previously "inaccessible" shopping area with more variety or lower prices).

As a negative consequence, each user of the proposed action would contribute to increased congestion on the freeway. As congestion increased on the new facility, the benefit attributable to potential travel time savings would be expected to decline. Congestion-related impacts (e.g., reduced air quality) would also increase over time. The overall contribution to projected traffic volumes on the proposed action, however, would be anticipated to be minimal (some of which is accounted for in regional traffic models).

It is important to consider that improvements proposed for any type of transportation system (e.g., a new bus route, rail transit line, commuter rail service) would

likely lead to changes in travel behavior, which, in turn, would lead to increased use of the particular system. Improvements made to a given transportation system are meant to attract new users. If this were not a primary goal, the improvements would be neither effective nor warranted. For the proposed action, a goal is to attract users of other segments of the Regional Freeway and Highway System and the local arterial street network, now and in the future, to the proposed action to optimize, in part, the entire regional transportation system (as outlined in the proposed action's purpose and need in Chapter 1). Further, it is important to consider that, as improvements are made to all transportation systems, cyclical benefits and impacts would occur. For example, as auto trips would be diverted to transit (either because of direct improvements or increased congestion), traffic congestion on parallel highway facilities may diminish, at least temporarily. The resulting reduction in highway traffic congestion may, in turn, attract additional highway trips, similar to an increase in highway capacity.

FHWA's position relative to induced travel is consistent with the consensus of the transportation planning and travel behavior research community: induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many of the travel choice decisions are accounted for in current travel forecasting models or land use-transportation interaction models.

Induced Growth

Unplanned growth is often termed "urban sprawl." Generally, the reference is made in the context of rapid and uncontrolled urban growth onto previously undeveloped land—usually on the outskirts of an existing urban area. Construction of projects like the proposed action is often identified as a major contributor to urban sprawl. Freeway projects are often cited as making land at the urban fringe more accessible and, therefore, more attractive for development.

But, as with issues surrounding induced demand, the relationship between transportation improvements and land development is complex. Land accessibility in a particular area as a result of a freeway project may make land more attractive for development, but other factors, such as utility infrastructure, quality of public services, land acquisition and development costs, economic conditions, and entitlement costs, assume major roles in determining where and how development would occur. In fact, in many cases, new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

Until the economic downturn that began in 2007, the past rate of growth and development far exceeded the ability of any major transportation infrastructure to keep pace. (Factors like affordable cost of living, employment opportunities, mild climate, reasonable accessibility, and a development-oriented regulatory environment will contribute to a resumption of a solid rate of growth.) Examination of data comparing population and land use between 1975 and 2000 suggests major transportation infrastructure projects like the proposed action are not major contributors to or inducers of growth in the region. For example, from 1975 to 2000, population increased by 211 percent from just over 1 million people to over 3.1 million people. The acreage of urban area increased from nearly 226,000 acres to just over 549,000 acres (143 percent increase). During this same time frame (and actually dating back to development patterns of the 1950s), population densities have remained constant at two households per acre. While newer development between 1991 and 2000 has generally been at four households per acre, the overall densities remain well below what transportation planners use as a rule of thumb for the minimum density needed to support a public transit-based network: seven households per acre. VMT have increased from 17 miles per day to approximately 21 miles daily (a 24 percent increase), and traffic delay and related congestion costs increased 350 to 360 percent in that same time period.

While the recession dramatically slowed growth in the Phoenix metropolitan area—and theoretically provided an opportunity for transportation infrastructure to catch up with the demographic forces that have historically fueled high growth—it has also affected resources at all levels of government that are the sources of funding for expansion of the regional transportation infrastructure. Federal economic stimulus funding has benefited projects that were far along in the planning process. Locally, Proposition 400 funding for transportation development in the MAG region depends on revenues from a tax on retail sales, which have been substantially lower than prerecession projections. Nationally, revenues derived from the federal fuel tax and which in part provide funding for highway development have decreased since the recession began (FHWA 2009b). More fuel-efficient vehicles and overall lower vehicle use have also contributed to this national decline in revenues. Because transportation capacity seriously lags transportation demand in the Study Area, it can be assumed the proposed action would neither induce growth nor facilitate any increase in the rate of growth under current or projected growth environments.

The proposed action would be implemented in a historically quickly urbanizing area (most noticeably in the Western Section of the Study Area—note that a nationwide recession beginning in 2007 slowed growth). On the eastern side of the Study Area, the proposed action abuts public parkland, Native American Community land, and a near-fully developed area and, therefore, any contribution to accelerated or induced growth is constrained. Historical and projected growth and the factors (including the proposed action) contributing to such growth are well-documented in Chapter 1, *Purpose and Need*, and in the sections, *Land Use* and *Economic Impacts*, beginning on pages 4-3 and 4-56, respectively. The proposed action would be built in an area planned for urban growth as established in local jurisdictions' land use planning activities for at least the last 25 years. If, on the other hand, the proposed action were to be located in rural or fringe areas, it would provide access to large tracts of undeveloped land. Some similar types of projects, in fact, in other parts of the country, were developed specifically to promote nonhighway economic development. In two such cases, FHWA is monitoring where a substantial highway improvement was completed whose purpose was to promote economic development. In the case of the proposed action, the

purpose of the project is not to promote economic development but to respond to a growing need for additional transportation capacity as a result of regional growth occurring now and as projected.

CUMULATIVE IMPACTS

Regulatory Basis

Federal guidance defines *cumulative impacts* as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 C.F.R. § 1508.7). Cumulative impacts are considered direct effects, which are "caused by the action and occur at the same time and place" (40 C.F.R. § 1508.8). Put another way, cumulative impacts occur where several actions in an area combine to create an impact greater than any one individual activity.

Methodology

The cumulative impact analyses considered:

- environmental resources that would be directly affected by the proposed action
- the area in which effects of the proposed action would be felt
- impacts that would result from the proposed action
- other past, proposed, and reasonably foreseeable future actions that have or could be expected to affect the same area
- expected impacts from other actions
- the overall expected impact if the individual impacts were allowed to accumulate

Parameters established to conduct the analyses were:

- Assess those critical, or at-risk, resources expected to substantially experience a cumulative impact. Logically, if the proposed action would not directly affect a particular environmental resource, the action would not contribute to a cumulative impact on that resource. This focused the analysis on critical, or at-risk, resources and fulfilled CEQ guidance (2005) that agencies should use scoping to focus on the extent to which information is "relevant to reasonably foreseeable significant adverse impacts" and is "essential to a reasoned choice among alternatives."
- During the analyses, follow two principles outlined by CEQ guidance (1997) in considering critical conditions: 1) focus only on the effects and resources within the context of the proposed action, and 2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.
- Establish a geographic, or spatial, boundary for impact assessment. The size of the cumulative impact study areas varied depending on the critical resource.
- Determine time frames for which to assess cumulative impacts as driven by CEQ guidance to consider past, present, and reasonably foreseeable changes that could result in cumulative impacts when combined with the effects of the proposed action. The start of the general urbanization of the greater Phoenix metropolitan area beginning in the 1950s was established as the historic time limit. Although not a specific individual action, the Study Area's urbanization is noteworthy because it highlights the "current aggregate effects of past actions without delving into the historical details of individual past actions" (CEQ 2005). In addition, the design year (estimated time when the freeway would provide its intended traffic capacity) of 2035 was used as the future time limit.
- Identify past, existing, and proposed relevant actions. Relevant actions were identified to evaluate when—in combination with the proposed action and its associated impacts—they could result in cumulative impacts. Reasonably foreseeable changes were limited to projects currently planned and funded. The following types of activities that could contribute to cumulative impacts were:
  - other highway projects initiated by the proposed action
  - planned mass transit projects in the Study Area
  - other major infrastructure projects (e.g., utility expansion)
  - other general development patterns

Other proposed transportation projects within or near the Study Area include high-capacity transit on I-10, median and outside widening of I-10 (Papago Freeway) between SR 85 and SR 101L, SR 30 freeway, I-10 (Maricopa Freeway) improvements, SR 303L extension, I-17 expansion project, and the ARS project. No other major infrastructure projects were identified aside from local arterial street widenings to serve existing growth.

Analysis of Potential Impacts

Resources Not Subject to Cumulative Impact Analysis

The relation of the proposed action to social, cultural, technical, economic, and natural components of the environment was reviewed to determine the potential for cumulative impacts. Resources assessed and determined not to be subject to cumulative impact analysis are presented in Table 4-56.

Resources Subject to Cumulative Impact Analysis

The contribution to cumulative effects among action alternatives is anticipated to be comparatively the same. The following critical issues warranted cumulative impact analysis.

Biological Resources

Habitat Loss

Construction and operation of the proposed action would irrevocably convert existing natural habitat to a transportation use and, therefore, contribute to a reduction in the amount of wildlife habitat in the region (EPA 2004). From 1975 to 2000, the proportion of land in human-related uses (e.g., urban) increased by an estimated 15 percent (the rate of increase to human-related uses was greatest during the period between 1975 and 1986, before freeways were constructed in the Phoenix metropolitan area). During this period, natural land uses decreased by 5 percent. Ongoing planned and permitted residential, commercial, and transportation development would likely further this trend of habitat loss through direct conversion, habitat isolation

Table 4-56 Resources Not Considered for Cumulative Impact Analysis

Resource	Rationale
Energy	While construction and operation of the proposed action would result in the direct use of energy, the proposed action and its alternatives would not use energy at a magnitude or rate beyond consumption as determined if no action were undertaken. Therefore, no further consideration will be given because the proposed action is not expected to vary usage levels considerably from existing and projected traffic patterns.
Utilities	While construction of the proposed action would require the relocation and adjustment of utilities, no new utility projects are identified in the Study Area to support the proposed action. Therefore, no further consideration is given.
Hazardous materials	Hazardous materials are not considered a resource upon which impacts from the proposed action or from other known projects would occur. Instead, hazardous material sites are a byproduct of the human environment. The hazardous materials report prepared for the proposed action considered the direct and indirect potential for the proposed action to disturb such sites; therefore, no further consideration is given (see sidebar on page 4-2 for information on reviewing the report).
Demographics	Because this project and other transportation projects have been designed to respond to population forecasts (as opposed to encouraging population growth where it might not otherwise occur), no cumulative impacts on demographics have been identified. Therefore, no further consideration is given.
Economics	The proposed action would not induce economic growth nor facilitate any increase in the rate of growth under the growth environment because the proposed action provides only a portion of the capacity shortfall in transportation support infrastructure that has been experienced throughout the region and, in particular, in the southwestern Phoenix metropolitan area. In addition, growth is geographically constrained by the presence of the existing urbanized area, Community[a] land, and SMPP.[b] Therefore, no cumulative impacts would occur.
Wild and scenic rivers	No wild and scenic rivers occur in the Study Area; therefore, no cumulative impacts would occur. No further consideration is given.
Sole source aquifer	No sole source aquifers occur in the Study Area; therefore, no cumulative impacts would occur. No further consideration is given.
Floodplains	Incompatible use or development within floodplains would not be facilitated by the proposed action. Developments within the area must comply with State and local zoning and floodplain ordinances; therefore, no cumulative impacts would occur.

[a] Gila River Indian Community [b] Phoenix South Mountain Park/Preserve

(addressed below), and native plant loss (addressed below). Also, wildlife typically is displaced, causing either increased competition among species members and/or population reduction.

Habitat Connectivity

Construction and operation of the proposed action would bisect existing natural habitat for the purposes of a transportation use and, therefore, would contribute to habitat isolation, inhibiting the movement of wildlife for life requirements. This effect would likely be most prevalent in the areas between the South Mountains and Sierra Estrella. Ongoing planned residential, commercial, and transportation development is reviewed and permitted by local jurisdictions on a case-by-case basis; however, most developments are too small to consider their individual contributing effects on habitat connectivity. However, when considered together, these ongoing developments would contribute to continued adverse effects on habitat connectivity. The provision of mitigation for the proposed action in the form of multiuse crossings to be situated in cooperation with federal and State wildlife officials would minimize impacts attributable to the proposed action.

Vehicle-animal Collisions

The movement of wildlife for life requirements in the Study Area suggests the construction and operation of the proposed action would increase the potential for vehicle-animal collisions in the region. This potential impact would likely be most prevalent along the segment of the freeway that would be between the South Mountains and Sierra Estrella. Ongoing planned and permitted development in this area would also contribute to an increase in collisions; however, this increase may be moderated by 1) slower travel speeds on the current and future local arterial street network, 2) lesser concentrations of wildlife in developing areas, and 3) the provision of mitigation for the proposed action in the form of multiuse crossings to be situated in cooperation with federal and State wildlife officials. Together, the proposed action and future projects (e.g., SR 30, ARS) would place high volumes of traffic near undisturbed areas along the Gila and Salt rivers. Therefore, these planned projects and the ongoing development would contribute to increasing numbers of vehicle-animal collisions. Over time, as the southwestern Phoenix metropolitan area develops, the incidence of this type of impact would likely diminish as habitat decreases and becomes less able to sustain large wildlife populations.

Native Plants

Ongoing conversion of natural areas to human-based development contributes to continued loss of native plants in the region. The proposed action would contribute to the loss of native plants because it would convert land known to have native plants to a transportation use (although the impact would be offset somewhat by project-specific proposed mitigation). Future residential, industrial, commercial, and transportation projects in conjunction with the proposed action can be reasonably expected to contribute to a loss of native vegetation, as defined and protected under

the Arizona Native Plant Act (A.R.S. § 3-901 et seq.). Notably, the proposed action as currently planned would convert natural areas around the South Mountains to a transportation use.

Invasive Species

The introduction of nonnative species and noxious weeds has occurred since the 1950s as a result of agricultural, industrial, and residential uses. The native plant species within and adjacent to the Study Area would decrease in both number and diversity, which could have an impact on endemic animal species, especially songbirds, that depend on them for food, shelter, and nesting. Nonnative trees and shrubs tend to attract nonnative bird species such as the house sparrow, European starling, and rock dove, and these bird species compete with native species for resources. The nonnative species readily adapt to their new environments, and most have prospered around the Study Area for many years. This is not always the case with endemic species and, over time, competition can lead to the depletion of a particular native species. If individuals of a native animal species present in the Study Area have another habitat to move to, with more available food and shelter, they stand a better chance of survival. Areas such as Tres Rios, Rio Salado, SMPP, and the Sierra Estrella are viable areas for native birds and small mammals. Federally funded and State-funded transportation projects in Arizona would increase the spread of noxious plants. Future residential, industrial, and commercial development and transportation projects without federal or State funding can also be reasonably expected to contribute to the potential introduction and spread of invasive species.

Threatened and Endangered Species

Several other projects in the Study Area could contribute to cumulative effects on the Yuma clapper rail and yellow-billed cuckoo. The proposed SR 30 freeway, from SR 303L to SR 202L (proposed South Mountain Freeway), would be located between the Gila and Salt rivers and Lower Buckeye Road; NEPA requirements will be addressed in an environmental assessment for that federally funded project. Also, the Rio Salado Oeste and Tres Rios wetlands projects will help restore wetlands and riparian areas along the Salt and Gila rivers from 83rd Avenue to the west. The restoration of the Salt and Gila rivers' riparian and wetland habitat could improve habitat conditions for the Yuma clapper rail and yellow-billed cuckoo. Effects on the Yuma clapper rail and yellow-billed cuckoo would be addressed in NEPA documentation for these projects as well.

Piers for a proposed freeway bridge along the W59 (Preferred) Alternative would be placed in the riverbed of the Salt River through the eastern half of a 192-acre BLM parcel leased to the City of Phoenix under provisions of the Recreation and Public Purposes Act for inclusion in the proposed Rio Salado Oeste project. The City of Phoenix is aware of, has planned for, and has incorporated the proposed freeway in its General Plan. The City has designated the Rio Salado Oeste project as incorporating the proposed freeway. Although the lease does not include a reference to the proposed freeway, BLM would support working with the City of Phoenix to take the steps necessary to amend the lease in a manner that would allow the proposed freeway to pass through the property, if the W59 Alternative were identified as the Selected Alternative in the ROD. Both parties concurred with this approach in August 2005 (see Appendix 1-1). As a result of this coordination and cooperative planning, no impacts on the proposed uses of this land or other planned wetlands and riparian restoration projects would occur.

Cumulative impacts resulting from future State or private actions are anticipated to include noise impacts and general human disturbance resulting from continuing development. No critical habitat is designated within the Study Area for any listed species (within the limits of disturbance, the proposed action may affect individuals of the Sonoran desert tortoise and Tucson shovel-nosed snake populations occurring in the Study Area).

Water Resources

Surface Water

Contaminants from Stormwater Runoff

Existing sources of water affecting water quality include drainage from the South Mountains through development areas, Gila Drain Floodway discharge, sand and gravel pit operations in and upstream of the Study Area, and the 91st Avenue WWTP treatment ponds. The proposed action, along with other planned roadway improvements (e.g., local arterial roadway widening and new roadway projects such as the proposed SR 30 and ARS), would contribute to cumulative impacts on water quality. Regionally, the presence of urban uses near water courses has increased by 8 percent from 1975 to 2000 (EPA 2004). Specifically, stormwater flow from other projects or other physical jurisdictions would combine with stormwater flow originating directly from the proposed action. Runoff from the freeway during infrequent rain storms would likely include lead, zinc, filterable residue, and total nitrogen. Other projects may include transportation, commercial, and residential development, which would result in less permeable surfaces to accommodate recharge and more impervious surfaces that act as pollution collection surfaces. This associated development would result in higher runoff volumes and a higher potential for pollutant discharges into receiving streams. However, these impacts would be minimized by providing BMPs during construction, following current design standards for detention facilities, and complying with federal and State permits for stormwater discharges.

Natural Drainage Features

Continued conversion of undisturbed land to human-based development in the region has altered surface drainage features, particularly ephemeral washes. The proposed action would contribute to such effects by altering natural drainage features immediately adjacent to the project (although the impact would be offset by project-specific proposed mitigation).

Future residential, industrial, commercial, and transportation projects would also modify natural

drainageways. Unlike the proposed action, the ability to manage and mitigate impacts from some ongoing planned and permitted residential and commercial development would be limited and, therefore, less likely subject to regulatory compliance that could reduce effects.

Groundwater

Groundwater is a source of public water supply in Arizona. In 1995, groundwater withdrawal in the Phoenix AMA supplied 39 percent of the total consumption of 2.29 acre-feet (ADWR 1999). About 64 percent of the withdrawal was used for agriculture. The remainder was used for public water supply, industrial, domestic, and other purposes. Population growth has resulted in the retirement of agricultural land and the conversion of the intended use of groundwater supplies to urban uses. Issues created by groundwater overdraft include decreased water levels in aquifers and increased well drilling and pumping costs. Some wells in the Study Area displaced by the proposed freeway would have to be fully replaced in accordance with 2006 ADWR well spacing and well replacement rules. Known land development planned in the Study Area as presented in the *Land Use* section of this chapter would likely contribute to increasing demands on groundwater supply; the proposed action could place further demand on water supplies temporarily during construction and for maintenance purposes. These demands on supply would be likely offset through the application of water reuse BMPs.

The profile of the proposed action (under the W71 and W101 Alternatives) would be depressed in certain areas of the Study Area that have relatively high groundwater tables. Water falling on the freeway would be concentrated into low areas along depressed sections and would then drain by gravity from the depressed sections of the freeway to the river. With development ongoing in the areas where depressed freeway sections are being considered, it is possible the proposed action could contribute to reductions in groundwater supply. Because surface drainage from storms would drain by gravity to the river, it is expected the proposed action would have little cumulative effect on groundwater. These effects would be minimized by providing BMPs during construction, following current design standards for detention facilities, and complying with federal and State permits for stormwater discharges.

Water Availability

Ongoing planned and permitted residential, commercial, and industrial development in the region would likely continue to place a demand on water availability. The proposed action would have little cumulative effect on water availability.

Cultural Resources

The proposed action may contribute to cumulative cultural resources impacts. However, the proposed action and other major planned transportation projects would potentially create preservation in place (enhancement) opportunities not typically associated with private-sector development projects. The opportunity to preserve in place would be the result of federal and State regulations promoting preservation of such resources when associated with a publicly funded project; these federal and State regulations generally are not applied to privately funded projects. Although the types of impacts would be typical of those experienced in constructing and operating other parts of the region's freeway system, some of these impacts would be effectively mitigated through the implementation of enhancement and management plans and other strategies.

Land Use

The amount of agricultural land in the Phoenix metropolitan area has decreased from over 50 percent in 1975 to just over 35 percent in 2000 (EPA 2004). With the exclusion of reservation land and, possibly, ranches, Maricopa County in 2007 had only 8 percent of its land as farmland (National Agricultural Statistics Service 2009). After considering what is planned by local municipal zoning ordinances, only 12 percent of the Study Area is planned for future agricultural use. Urban growth in the Phoenix metropolitan area is contributing to the conversion of farmland to urban uses. The proposed action would contribute by converting farmland within the proposed R/W to a transportation use. Other planned transportation projects (e.g., SR 30, ARS, I-10 widening) would also contribute to the farmland conversion. Future residential, industrial, and commercial development projects and local street improvements would also contribute to farmland conversion, most of which is planned for in local jurisdictions' planning documents.

The proposed action is considered a contributing factor to the cumulative impacts on residential and business displacements. Other primary contributors to displacement impacts would be other planned transportation projects (e.g., SR 30, ARS, and some arterial street widening projects). Future residential, industrial, and commercial development projects and local street improvements are not expected to result in substantial relocations because the vast majority of this development would occur within existing transportation R/W or on vacant parcels or agricultural land.

A transition from rural agricultural to moderate density homogeneous single-family residential use has continued to occur. Several factors contribute to the change: affordable cost of living, employment opportunities, mild climate, reasonable accessibility, and a development-oriented regulatory environment. Examination of data comparing population and land use between 1975 and 2000 suggests major transportation infrastructure projects like the proposed action are not major contributors to or inducers of growth in the region. For example, from 1975 to 2000, population increased by 211 percent from just over 1 million people to over 3.1 million people. The extent of urban area increased from nearly 226,000 acres to just over 549,000 acres (143 percent increase). During this same time frame (and actually dating back to development patterns of the 1950s), population densities have remained constant at two households per acre. While newer development between 1991 and 2000 is at four households per acre, the overall densities remain well below what transportation planners use as a rule of thumb for the minimum density needed to support a public transit-based network: seven households per acre.

VMT and traffic delay and related congestion costs have increased in that same time period. Until the economic downturn that began in 2007, the past rate of growth and development far exceeded the ability of any major transportation infrastructure to keep pace. While the recession slowed growth in the Phoenix metropolitan area—and theoretically provided an opportunity for transportation infrastructure to catch up with the demographic forces that have historically fueled high growth—it has also reduced governmental sources of funding for expansion of the regional transportation infrastructure. Locally, Proposition 400 funding for transportation development in the MAG region depends on revenues from a tax on retail sales, which are substantially lower than prerecession projections. Nationally, the federal fuel tax, which in part provides funding for highway development, decreased from 6 to 4 percent during the recession (FHWA 2009b). The use of more fuel-efficient vehicles and overall lower vehicle usage has also contributed to the national decline in revenues. Because transportation capacity seriously lags transportation demand in the Study Area, it can be assumed the proposed action would neither induce growth nor facilitate any increase in the rate of growth under current or projected growth environments.

The proposed action would displace residences, businesses, public and quasi-public facilities; alter current access patterns; and introduce a major transportation facility where one does not currently exist. Other planned transportation projects (e.g., ARS) would have similar effects. The construction and operation of these projects would have a cumulative effect on the region's communities that maintain distinct characteristics. The planned projects, including the proposed action, could affect distinct communities' characteristics through displacements, noise intrusion, the introduction of a high-intensity land use that may conflict with more passive community land uses, and alteration of a community's sense of place and/or internal circulation.

Environmental Justice

The evaluation to determine whether there would be disproportionate impacts on any population with environmental justice characteristics revealed that all action alternatives would have direct but not disproportionate impacts on such populations. Considering the proposed action would be accessible to all populations in the Study Area, the impacts would not be disproportionately high, and mobility benefits would occur. Benefits would include enhanced access to and from employment opportunities and enhanced movement of goods and services for improved access to such goods and services for all population segments.

Some populations with environmental justice characteristics have specific needs associated with their identity being tied directly to geographic setting. For Native American populations near and adjacent to the proposed action, association with cultural values of the South Mountains is important to identity and is established through direct spiritual and visual access to the mountains. Land developments in the area have encroached on the South Mountains, and the proposed action would contribute to further encroachment on the southern side of the mountains. The contribution of the proposed action to this cumulative effect would be offset somewhat by the provision of freeway underpasses, allowing individuals from the populations to continue unrestricted access to the mountains, and by the provision of R/W fences along the border with the Community, which would prevent some of the unlawful trespass that currently occurs. Continued land development in the area also would contribute to a cumulative modification of visual access to the resource, and the proposed action also would contribute to the alteration of views of the mountains [although the effect would be offset by measures to be undertaken to minimize harm to the resource, as described in Chapter 5, *Section 4(f) Evaluation*].

Visual Resources

The area has experienced and will continue to experience a rapid transition in land use from low-density, open uses to residential, commercial, and light industrial uses. Large subdivisions have been developed in open agricultural land, and residential development has encroached onto the southern side of the South Mountains. These actions would all generally contribute to the continuation of the rapid development of the southwestern Phoenix metropolitan area from an agricultural-oriented past to a suburban- and urban-appearing present and future. The proposed freeway would be a part of this trend. The perception of open spaces with distant mountain backdrops would change to one of expanding suburban and urban development. The backdrop would remain, but the foreground and middle ground would change so substantially that the visual perception, over time, would change dramatically. This is a trend that is underway and would continue with or without the proposed freeway. Sensitive views along the E1 Alternative would be affected; however, the road cuts proposed for the western end of the South Mountains would be treated to ensure that the newly exposed rock faces would be characteristic of the adjacent natural rock features, including scale, shape, slope, and fracturing to the extent that could be practicable and feasible as identified through geotechnical testing and constructibility reviews. Rounding and blending of new slopes to mimic the existing contours to highlight natural formations and warping slopes at intersections of cuts and natural grades to transition with natural ground surfaces would be attempted. Because of the enactment of the Phoenix Mountain Preserve Act in 1990 [see Chapter 5, *Section 4(f) Evaluation*], it is unlikely that additional impacts to the South Mountains of this magnitude would occur.

Recreational Land

Recreational lands and facilities are valued in the Phoenix metropolitan area. This value is established through identification of recreation as an important and key element in local and regional land use plans and through recognition of its role as an important component of the region's tourism industry. In the region, recreational resources take the form of a wide array of facilities such as neighborhood, community, and regional parks; active playfields (e.g., baseball fields); equestrian, bicycle, and multiuse trails; and mountain preserves and open space. In the past, some of these resources have been converted to residential,

commercial, and transportation uses. The enactment of the Phoenix Mountain Preserve Act in 1990 [see Chapter 5, *Section 4(f) Evaluation*] was intended to curb the loss of mountain preserve resources from land development encroachment. The proposed action, by design, takes measures to minimize its contribution to further loss of recreational resources. With the exception of SMPP (where avoidance was determined not feasible), all recreational resources were avoided. Measures to minimize harm to SMPP, including the provision of replacement lands as described in Chapter 5, would reduce impacts to the lowest level possible and would ensure that active recreational areas within SMPP would not be affected. As development continues in the Study Area and surroundings, it is reasonable to conclude that such developments (as permitted by local jurisdictions on a case-by-case basis) may use recreational land in the future. Conversely, many new residential developments are setting aside land for future park development, some of which may be transferred to public ownership and access. Transportation projects in the region have resulted in uses of some recreational facilities, but in many cases these projects have resulted in improved access or provided additional protection to recreational lands.

Noise

Noise is an unwanted sound that can intrude on and have effects on the resources of the human and natural environments. The noise analysis conducted for the proposed action considered potential impacts where they are likely to occur (within 1,000 feet of the proposed alignments) based on the increase over existing ambient levels and projected future levels attributable to the proposed action. The transportation demand model used to predict traffic volumes on the proposed freeway would redistribute traffic on regional freeways and arterial streets in response to the construction of the proposed action. Therefore, increases or decreases in traffic (and noise) on these facilities would also be predicted. With the planned growth and urbanization in the Study Area, noise levels would be expected to increase because of the increased density of human activities. To minimize noise impacts from construction activities, construction best practices (e.g., properly operating, maintaining, and shielding equipment noise from sensitive receivers) would be used as much as possible.

Air Quality

Air quality may be a local, regional, or global issue depending on the particular pollutants or issue. At the local and regional level, air quality issues are normally related to criteria pollutants for which national air quality standards have been established and to MSATs. Emissions of these pollutants (mostly derived from mobile sources) have generally decreased in the Phoenix metropolitan area over time. These decreases may largely be associated with cleaner fuels and lower-emission vehicles. More gains may be achieved, except that VMT will likely increase and may continue to offset the emissions decreases in the future. A future increase in overall traffic volumes can be expected in the region following construction of planned residential and commercial developments. The proposed action is intended to reroute existing traffic patterns and accommodate future traffic volumes (as opposed to generating additional volumes) and, therefore, is not expected to contribute to a cumulative impact on air quality. Transportation projects planned in the region would minimize subsequent increases in vehicular emissions by reducing congestion and vehicle idling. In heavily congested conditions, some emissions increase with decreased speeds. More fuel is consumed because automobile engines do not operate optimally at low speeds and more emissions may be emitted. Additionally, a vehicle's emissions control equipment is not as effective at low speeds as it is at typical freeway speeds. Future emission levels would also be reduced by the use of cleaner-burning fuels, technological advances in automotive design (including the greater use of alternative fuel vehicles), reformulated gasoline, gas can standards, stricter enforcement of emission standards during inspections, heavy-duty diesel engine and on-highway diesel sulfur control programs, and others.

At the global level, the potential change in GHG emissions is very small in the context of the affected environment. FHWA is working to develop strategies to reduce transportation's contribution to GHG emissions—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. In addition, construction best practices to be implemented represent practicable project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

Heat Island

As buildings, parking lots, roads, and other infrastructure replace open land and vegetation, an urban heat island may result. The heat island effect is of a regional nature and, therefore, there is no requirement to analyze potential impacts and no possibility of determining the localized contribution at the project level to the regional heat island effect. It is likely, however, that a project such as the proposed freeway would be a minor contributor to the overall issue.

NO-ACTION ALTERNATIVE

If the proposed action were not implemented, the incremental effects contributed *solely* by the proposed action would not occur. The No-Action Alternative would not, however, preclude other activities from affecting resources in a similar manner. Most cumulative impacts would result from ongoing conversion of land to more intensive, human-based development. These effects, such as the permanent loss of cultural resources and the permanent loss of agricultural land, would occur without the proposed action in place.

MITIGATION

Disclosure of secondary and cumulative impacts does not require ADOT to propose and implement mitigation measures to address such impacts. Project-specific mitigation measures as proposed to address direct impacts inherently address reductions in such overall impacts as well. The disclosure primarily is for information purposes. By disclosing these types of impacts, those concerned are provided a mechanism to contact responsible parties

either contributing to such impacts or having regulatory authority pertaining to such matters. For example, EPA has enacted rules to reduce vehicle emissions at national and regional levels. Local jurisdictions governing land development have enacted local zoning ordinances to control and regulate development.

Mitigation measures in Table 4-57 summarize project-specific measures already presented throughout this chapter. When implemented, the measures would help to offset the adverse secondary and cumulative impacts of the action alternatives.

CONCLUSIONS

The action alternatives would have comparable secondary and cumulative effects. The various activities affecting resources and people in the Study Area as well as the proposed action could have localized variations at the project level. When viewed cumulatively, however, a broader view of each resource should be considered, and, from this perspective, each action alternative would have comparable effects. All alternatives would occur in an already rapidly urbanizing area (most noticeably in the Western Section of the Study Area—note that the recession slowed growth), an area planned for urban growth as established in local jurisdictions' land use planning activities for the last 25 years. As such, the proposed action would not provide new or substantially improved access to a large, undeveloped geographic area. Therefore, the action alternatives are not expected to induce growth in the region. For the action alternatives, the minimal contribution to overall traffic use by induced travel is expected to have both positive and negative consequences.

Secondary and cumulative impacts from any of the action alternatives would occur. The proposed action may produce secondary impacts on biological resources, water resources, air quality, known historic and prehistoric sites, newly discovered historic and prehistoric sites, land use conversions and displacements and relocations, community character and cohesion, and on property value changes. As a result of the proposed action, cumulative impacts may occur on biological resources, water resources, cultural resources, land use, environmental justice, visual resources, recreational land, noise, and air quality.

Table 4-57 Representative Project-specific Mitigation Measures

Issue	Proposed Action Impact	Mitigation Measure
Biological resources	Habitat loss from direct conversion to transportation use	Construct wildlife crossings; salvage native plants; provide native plantings in right-of-way; implement measures to prevent the spread of invasive species in accordance with Executive Order 13112
	Habitat isolation and fragmentation	
	Vehicle-animal collisions	
	Loss of native vegetation	
	Introduction of noxious weeds	
	Threatened and endangered species	
Water resources	Increased runoff and flushed contaminants from impervious surfaces	Best management practices used; erosion control provided during and after construction; measures included in the Arizona Stormwater Pollution Prevention Plan and Arizona Pollutant Discharge Elimination System Permit
	Loss and/or alteration of natural drainage features	Fill in jurisdictional areas avoided or limited by narrowing the roadway width or by other means; compliance with Sections 404 and 401 permits
Land use	Residential and business displacements	Relocations conducted in accordance with federal and State guidance/regulations; land uses converted in accordance with applicable planning and zoning
	Alteration of community character and cohesion	Overpasses; architectural treatment of structures; and adherence to established design standards, general plans, and zoning
	Local traffic access pattern alteration; improved traffic flows during operation	Alternative access routes identified during construction as part of the traffic plan
	Public service access	ADOT[a] traffic plan to minimize construction impacts on existing routes
Economic conditions	Enhanced movement of goods, materials, and people; property value changes	Local governments to ensure development is consistent with local and regional planning

[a] Arizona Department of Transportation

CONCLUSIONS

This chapter recounts the scientific and analytical basis for comparison of the alternatives. It focuses on elements necessary to support comparison of action alternatives to advance the decision-making process and identify possible mitigation measures. The chapter necessarily highlights differences in impacts among action alternatives. General conclusions drawn from the findings presented in this chapter are:

- The Western and Eastern Sections of the Study Area present distinctly different environmental conditions.
- None of the kinds and degrees of impacts identified are atypical for a project like the proposed action.
- For most environmental elements, the kinds and degrees of impacts are relatively similar among the action alternatives; some noteworthy differences among the action alternatives do exist.
- Because of historical and projected population, job, and housing growth in the area, impacts on resources of concern would occur under the No-Action Alternative. In some instances, impacts under the No-Action Alternative would be greater than those that would occur under the action alternatives. As a specific example, energy use—in terms of annual fuel consumption—would be greater under the No-Action Alternative than under any of the action alternatives.

The proposed action would contribute to cumulative impacts on resources of regional concern. Historic and projected growth in employment, population, and housing has, however, generated the need for the proposed action; the proposed action would contribute little to inducing unplanned growth in the region.

Design of the action alternatives was developed to a level that facilitated meaningful analytical comparison of alternatives. Quantified impacts (e.g., anticipated displacements and relocations) would be subject to changes as design would be further refined. Changes resulting from such design refinement would not diminish the value of the comparative analyses presented in this chapter. Typically, such refinements would occur when ADOT and FHWA determine that such refinements would result in cost savings and/or reductions in identified impacts.

Mitigation measures presented throughout the chapter would be effective in avoiding, reducing, or otherwise mitigating impacts from action alternatives.

Specific to the Western Section, noteworthy observations related to impacts among the action alternatives are:

- The W59 (Preferred) Alternative would result in the fewest residential displacements (727) when compared with either the W71 or W101 Alternative (the W71 Alternative would cause 839 displacements and the W101 Alternative would cause between 940 and 1,318 residential displacements).
- Implementation of the W59 Alternative would displace a greater number of businesses (42) than would implementation of either the W71 or W101 Alternative. The W71 Alternative would displace 26 businesses. The W101 Alternative would displace 14 to 30 businesses, and it would potentially displace the most employees, suggesting that relocation mitigation measures associated with the businesses affected by the W101 Alternative would be the greatest among the action alternatives in the Western Section.
- Each action alternative would cause property and sales tax revenue losses because of the conversion of taxable property to a public transportation use (a nontaxable property). Overall, the action alternatives' effects on the overall tax base for affected municipalities (the Cities of Phoenix, Avondale, and Tolleson) would be negligible, with one exception: Implementation of the W101 Alternative would reduce the City of Tolleson's tax base by between 20 and 24 percent annually. The reduction would be a substantial impact and would hinder the City's ability to provide public services.
- Implementation of any of the action alternatives would be consistent with the intent of the RTP by virtue of completing the southwestern leg of SR 202L. Because it most closely approximates the alignment adopted in the RTP, the W59 Alternative is the alternative most consistent with the adopted plan.
- The degree, magnitude, intensity, and context of impacts from implementation of any of the action alternatives in the Western Section would be comparable for air quality, noise environment, water resources, floodplains, jurisdictional waters, biological resources, topography, geology, soils, hazardous materials, visual resources, cultural resources, and social conditions. In all instances, the magnitude of impacts from implementation of any of the action alternatives in the Western Section would be negligible with respect to the overall quality and robustness of the resources.
- With implementation of any of the action alternatives in the Western Section, adverse impacts would occur on populations protected under Title VI and the environmental justice Executive Order; impacts would not, however, be disproportionately high or cause undue hardship when compared with such impacts on the general population.

In the Eastern Section, a comparative analysis of action alternatives was not undertaken because only one action alternative, the E1 (Preferred) Alternative, is under detailed study. Notable conclusions from the analyses of the E1 Alternative are:

- The alignment would pass south of Ahwatukee Foothills Village (replacing the existing four-lane Pecos Road) and would result in 121 residential displacements.
- While unlikely to substantially alter the community character and cohesion of Ahwatukee Foothills Village, the E1 Alternative would increase visual and noise intrusions into the area.
- Existing drainage patterns from the South Mountains involve the release of runoff onto Community land; these patterns and the timing of runoff releases would be altered. Where drainage currently enters Community land through a series of natural washes, detention basins as part of the proposed freeway's design would capture runoff and meter releases onto Community land.

- Implementation of the E1 Alternative would adversely affect recreational, visual, natural, and cultural values of resources in the South Mountains. Although such impacts would directly affect less than 1 percent of the SMPP acreage, the intensity of the impact would vary, depending on the resource. In some instances, it would not be possible to avoid resources, or impacts on resources, nor would it be possible to reduce or otherwise mitigate impacts.
- The E1 Alternative would alter topography through the South Mountains. Specifically, the freeway would cross the mountains through severe cuts through three mountain ridges.

With consideration of the content of this entire chapter [and the following Chapter 5, *Section 4(f) Evaluation*] and in consideration of recurring concerns expressed by the public, the key issues of concern regarding the primary function of the analyses in Chapter 4 relate to economic impacts, displacements and relocations, societal impacts relating to community character and cohesion, cultural resources impacts, South Mountains impacts, air quality impacts, and secondary and cumulative impacts. Table S-3, *Environmental Impact Summary Matrix, Proposed Action*, in the *Summary* chapter, further highlights similarities and differences among the alternatives. Table S-4, *Mitigation Measures, Arizona Department of Transportation, Action Alternatives*, also in the *Summary* chapter, presents a comprehensive list of measures proposed to mitigate impacts presented in this chapter.

The purpose of this conclusions section is not to summarize all the data and analyses presented throughout the chapter (such summary information can be found in Tables S-3 and S-4). It also is not intended to make a determination regarding the environmentally preferred alternative. Other factors—such as operational performance, design parameters, public and political acceptability, and conceptual construction, operation, and maintenance cost estimates—functionally interact with environmental conditions and play a role in the EIS process. Those factors, along with the content of this chapter, have led to the identification of a Preferred Alternative as described in Chapter 3, *Alternatives*.

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[1] includes Foothills Club West

[2] personal communication, representative of Holsum Bakery, 2004

[3] personal communication, representative of Bay State Milling Company, 2005

[4] The sampling of the residential data was stratified but random—stratified in the sense that houses of similar size and relatively new vintage were examined, but random in the sense that no consideration was given to the neighborhoods from which these samples were drawn. If the house was located in a lower socioeconomic part of town, it was weighted equally as one located in a higher socioeconomic neighborhood. Overall, this could bias the results downward because most neighborhoods in the Study Area are newly developed and are likely considered more desirable than average. As a result, the project team assumed residential values were adjusted upward to reflect this.

[5] Because of inflation, the value of a dollar now is greater than a dollar in the future. The discounted present value is the value *now* of a dollar in a future year (for this analysis, in 2035), discounted at a constant percentage rate to reflect its annual loss in value attributable to projected inflation. For this analysis, a discount rate of 3 percent per year was used.

[6] U.S. Environmental Protection Agency. "National Ambient Air Quality Standards." Agency Web site, <epa.gov/ttn/naaqs/>.

[7] Arizona Department of Environmental Quality. "Air Quality Monitoring: Air Quality Monitoring Links." Department Web site, <azdeq.gov/environ/air/index.html>.

[8] U.S. Environmental Protection Agency. "Criteria Pollutants." Agency Web site, <epa.gov/air/criteria.html>.

[9] correspondence with L. Seals, Maricopa County Air Quality Department, on September 9, 2010

[10] U.S. Environmental Protection Agency. "Ozone—Good Up High, Bad Nearby." Agency Web site, <epa.gov/oar/oaqps/gooduphigh/good.html>.

[11] U.S. Department of Labor, Occupational Safety and Health Administration. "Acrolein and/or Formaldehyde." Department Web site, <osha.gov/dts/sltc/methods/organic/org052/org052.html>.

[12] U.S. Environmental Protection Agency. "Acrolein." CAS#107028. Agency Web site, <epa.gov/ttn/atw/hlthef/acrolein.html>.

[13] U.S. Environmental Protection Agency. "Benzene TEACH Chemical Summary." <epa.gov/teach/chem_summ/BENZ_summary.pdf>.

[14] U.S. Environmental Protection Agency. 2006. "Control of Hazardous Air Pollutants from Mobile Sources; Proposed Rule." *Federal Register* 71(60):15803–963.

[15] Agency for Toxic Substances and Disease Registry. "Medical Management Guidelines for 1,3-Butadiene." Agency Web site, </atsdr.cdc.gov/mmg/mmg.asp?id=455&tid=81>.

[16] U.S. Environmental Protection Agency Integrated Risk Information System. "1,3-Butadiene (CASRN 106990)." Agency Web site, <epa.gov/iris/subst/0139.htm>.

[17] U.S. Environmental Protection Agency. 2006. "Control of Hazardous Air Pollutants from Mobile Sources; Proposed Rule." *Federal Register* 71(60)40:15803–963.

[18] California Office of Environmental Health Hazard Assessment. "Health Effects of Diesel Exhaust." Department Web site, <oehha.ca.gov/public_info/facts/dieselfacts.html>, Sacramento, California.

[19] U. S. Environmental Protection Agency. "Technology Transfer Network Air Toxics Web Site. Formaldehyde." <epa.gov/ttn/atw/hlthef/formalde.html>.

[20] Agency for Toxic Substances and Disease Registry. "Toxicological Profile for Formaldehyde (CAS# 5000)." Agency Web site, <atsdr.cdc.gov/toxprofiles/tp.asp?id=220&tid=39>.

[21] U.S. Environmental Protection Agency. 2001. "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements." *Federal Register* 66(12):5001–93.

[22] U.S. Environmental Protection Agency. Technology Transfer Network. "1996 National-Scale Air Toxics Assessment." Agency Web site, <epa.gov/ttn/atw/nata/>.

[23] U.S. Environmental Protection Agency. Technology Transfer Network. "1996 National-Scale Air Toxics Assessment; Emissions Data Tables." Agency Web site, <epa.gov/ttn/atw/nata/tablemis.html>.

[24] personal communication, Jeff Houk, Air Quality Specialist, Federal Highway Administration Resource Center, Lakewood, Colorado, September 25, 2013

[25] The 308.7 million people in the United States in 2010 generated 2.96 trillion VMT on roadways in 2010, for an average of 9,587 miles per person, or 26.3 miles per person per day. If a person traveled that distance each day for an entire 70-year lifetime, he or she would have a one-in-a-million chance of dying in a traffic accident for each 90 miles of driving (about 3 days' worth).

[26] Table 3.2-14, Final Regulatory Impact Analysis, Control of Hazardous Air Pollutants from Mobile Sources, February 2007

[27] Calculated from data in U.S. Environmental Protection Agency's *Inventory of Greenhouse Gas Emissions and Sinks, 1990–2009*.

[28] Calculated from data in U.S. Energy Information Administration's *International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy*, <eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8>, accessed September 12, 2011.

[29] Calculated from data in U.S. Energy Information Administration's Figure 104, <205.254.135.24/oiaf/ieo/graphic_data_emissions.html>, and U.S. Environmental Protection Agency's Table ES-3, <epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf>.

[30] From <epa.gov/otaq/models/moves/index.htm>. EPA's MOVES model can be used to estimate vehicle exhaust emissions of CO_2 and other GHGs. CO_2 is frequently used as an indicator of overall transportation-related GHG emissions because the quantity of these emissions is much larger than that of all other transportation-related GHGs combined, and because CO_2 accounts for 90 to 95 percent of the overall climate impact from transportation sources. The model includes estimates of both emissions rates and vehicle miles traveled; these were used to estimate the Arizona statewide highway emissions in Table 4-37.

[31] Arizona emissions represent a smaller share of global emissions in 2035 because global emissions increase at a faster rate.

[32] For example, Figure 114 of the U.S. Energy Information Administration's *International Energy Outlook 2010* shows that future emissions projections can vary by almost 20 percent, depending on which scenario for future economic growth proves to be most accurate.

[33] When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency is required to make clear that such information is lacking (40 C.F.R. § 1502.22). The methodologies for forecasting GHG emissions from transportation projects continue to evolve, and the data provided should be considered in light of the constraints affecting the currently available methodologies. As previously stated, tools such as EPA's MOVES model can be used to estimate vehicle exhaust emissions of CO_2 and other GHGs. However, only rudimentary information is available regarding the GHG emissions impacts of highway construction and maintenance. Estimation of GHG emissions from vehicle exhaust is subject to the same types of uncertainty affecting other types of air quality analyses, including imprecise information about current and future estimates of VMT, vehicle travel speeds, and the effectiveness of vehicle emissions control technology. Finally, there presently is no scientific methodology that can identify causal connections between individual source emissions and specific climate impacts at a particular location.

[34] For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy Web site: <nhtsa.gov/fuel-economy>.

[35] SMCLs are guidelines that identify acceptable concentrations of contaminants that cause unpleasant tastes, odors, or colors in the water. As guidelines, they are not enforceable. SMCLs are for contaminants that will not cause adverse health effects.

[36] personal communication, D. Owsiany, U.S. Army Corps of Engineers, Phoenix/Nevada Area Office, December 31, 2003

[37] personal communication, staff at Phoenix South Mountain Park/Preserve Education Center, December 16, 2005; personal communication, Evelyn Erlandsen, Arizona Game and Fish Department, December 8, 2005

[38] personal communication, Tom Hildebrandt, Wildlife Program Manager, Arizona Game and Fish Department, 2004

[39] <fws.gov/southwest/es/arizona/Yuma_Rail.htm>

[40] <mbr-pwrc.usgs.gov/id/framlst/i3870id.html>

[41] <fws.gov/southwest/es/arizona/TucsonShovelNosed.htm>

[42] <fws.gov/midwest/eagle/viewing/eaglepix.html>

[43] personal communication, Kenneth Jacobson, Arizona Game and Fish Department Bald Eagle Management Coordinator, with HDR Engineering, Inc., on April 21, 2010

[44] The latest list of restricted routes in Arizona was published in *Federal Register*, 65(233), December 4, 2000.